Agricultural Development in Mid Saxon England

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Abstract

Over the past decade, historians and archaeologists have become increasingly aware that the Mid Saxon period in England (7th-9th centuries AD) witnessed a transformation in agricultural practices. According to the emergent consensus, in contrast to the heavily pastoral, broadly subsistence-based mode of agriculture characteristic of the Early Saxon period (5th-7th centuries), Mid Saxon agriculture was geared towards higher levels of surplus production and placed a greater emphasis upon arable farming. The increased cultivation of bread wheat and the specialist production of sheep's wool have been identified as particularly important innovations of this period.

This thesis represents the first attempt to explore agricultural development in Mid Saxon England on a systematic archaeological basis. It considers settlement, zooarchaeological, and archaeobotanical evidence in detail, with a special emphasis on charred plant remains. The analyses utilize data gathered from excavation reports, published and unpublished, covering two case study regions: (i) the Upper/Middle Thames valley and environs, and (ii) East Anglia and Essex. In addition, a sub-assemblage of charred plant remains from a Mid Saxon monastic site at Lyminge (Kent) is studied at first hand.

In this way, a series of agricultural innovations is identified in the archaeological record, including in particular: specialized pastoralism, an increased emphasis on sheep in some regions, an expansion of arable production, growth in fibre production, growth in cereal surpluses, a consequent investment in specialist storage and processing facilities, and a general diversification of crop spectra. These innovations were contingent upon, and adapted to, local environmental factors. The process of agricultural development is thought to have begun in the 7th century and continued through the 8th and 9th centuries, facilitated and stimulated by newly consolidated élite landholdings and, probably, a growing population.

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Abbreviations & Notes

EHD	*English Historical Documents* (Whitelock 1979).
HE	Bede, *Historia Ecclesiastica Gentis Anglorum*.
HAB	Bede, *Historia Abbatum*
VCB	Bede, *Vita Sancti Cuthberti.*
DOEPN	Biebaumer, P. & Sauer, H. with Klug, H.W. & Krischke, U. (eds.) (2007-2009). *Dictionary of Old English Plant Names.* <http://www.oldenglish-plantnames.org>, accessed May 2013.
HER	Historic Environment Record
NGR	National Grid Reference
PH	posthole
SFB	sunken-featured building
Beds	Bedfordshire
Berks	Berkshire
Bucks	Buckinghamshire
Cambs	Cambridgeshire
Glos	Gloucestershire
Hants	Hampshire
Herefs	Herefordshire
Lincs	Lincolnshire
Northants	Northamptonshire
Oxon	Oxfordshire
Warks	Warwickshire
Wilts	Wiltshire
Yorks	Yorkshire

Notes

All dates are AD unless stated otherwise.

Figures are rounded to one decimal place unless stated otherwise.

The terms *Grubenhaus* (pl. *Grubenhäuser*) and Sunken-Featured Building are considered to be synonymous.

1 Introduction

1.1 Research outline

This study aims to address the question of how agricultural productivity was enhanced in southern Britain between the Early and Mid Saxon periods (5th-9th centuries AD), through the analysis of selected archaeological evidence.

This chapter introduces the historiographical background to the research topic, and explains why the Mid Saxon period in particular is thought to have witnessed an enhancement in agricultural productivity. The second chapter sets out the theoretical framework within which the concept of 'agricultural development' is considered, and offers a brief, critical review of key developmental models that have been proposed for Mid Saxon agriculture. Chapter 3 describes the methodological basis of this study, defining its geographical and chronological scope, and outlining the chosen methods of data collection and analysis.

Chapter 4 introduces the archaeological and environmental contexts of the study regions, considering factors such as geology and topography, alongside palaeoenvironmental data which lie beyond the immediate scope of this project, such as pollen sequences. The core dataset of this study is then introduced and analysed over the next four chapters: the evidence pertaining to animal husbandry in Chapter 5, charred plant remains in Chapter 6, the structural evidence for crop storage and processing in Chapter 7, and waterlogged and other plant remains in Chapter 8.

In Chapter 9, the results of the foregoing analyses are synthesised. By way of conclusion, the chapter also considers the significance of this work in the wider context of Anglo-Saxon studies, and suggests avenues for future research. Three appendices provide: (i) an illustrated gazetteer of the sites included in the core dataset; (ii) concordance tables of all the archaeobotanical samples

analysed in this study, allowing the reader to locate these data in their original reports; and (iii) the full results of an original archaeobotanical investigation of a Mid Saxon sub-assemblage from Lyminge (Kent) undertaken as part of this project.

1.2 Historiographical background

A range of documentary and archaeological evidence now suggests that the Mid Saxon period, a conventional term for the years between *c.*AD 650 and *c.*AD 850 in England, offers a historical context that was both conducive to, and to some extent dependent upon, growth in agrarian productivity. This perspective stands in marked contrast to the consensus that had been reached by the mid-20th century, which posited wholesale innovation beginning much earlier, in the 5th-6th centuries. The first Anglo-Saxon immigrants, so it was held, introduced a whole new system of farming to the post-Roman landscapes in which they settled, clearing woodland and waste ground in order to construct nucleated villages surrounded by large open fields, which they tilled with their heavy mouldboard ploughs.[1] In short, the Anglo-Saxon settlers were held responsible for the introduction of heavy ploughing and the 'Midland-type' open field system that characterized much of England's later medieval countryside (Figure 1.1). Patterns of dispersed settlement and irregular fields, by contrast, were often thought to be native or 'Celtic' in origin.[2]

[1] *E.g.* Whitelock 1952 p.14; Hoskins 1955 p.55.
[2] Maitland 1897 p.15; Gray 1915 pp.409–18.

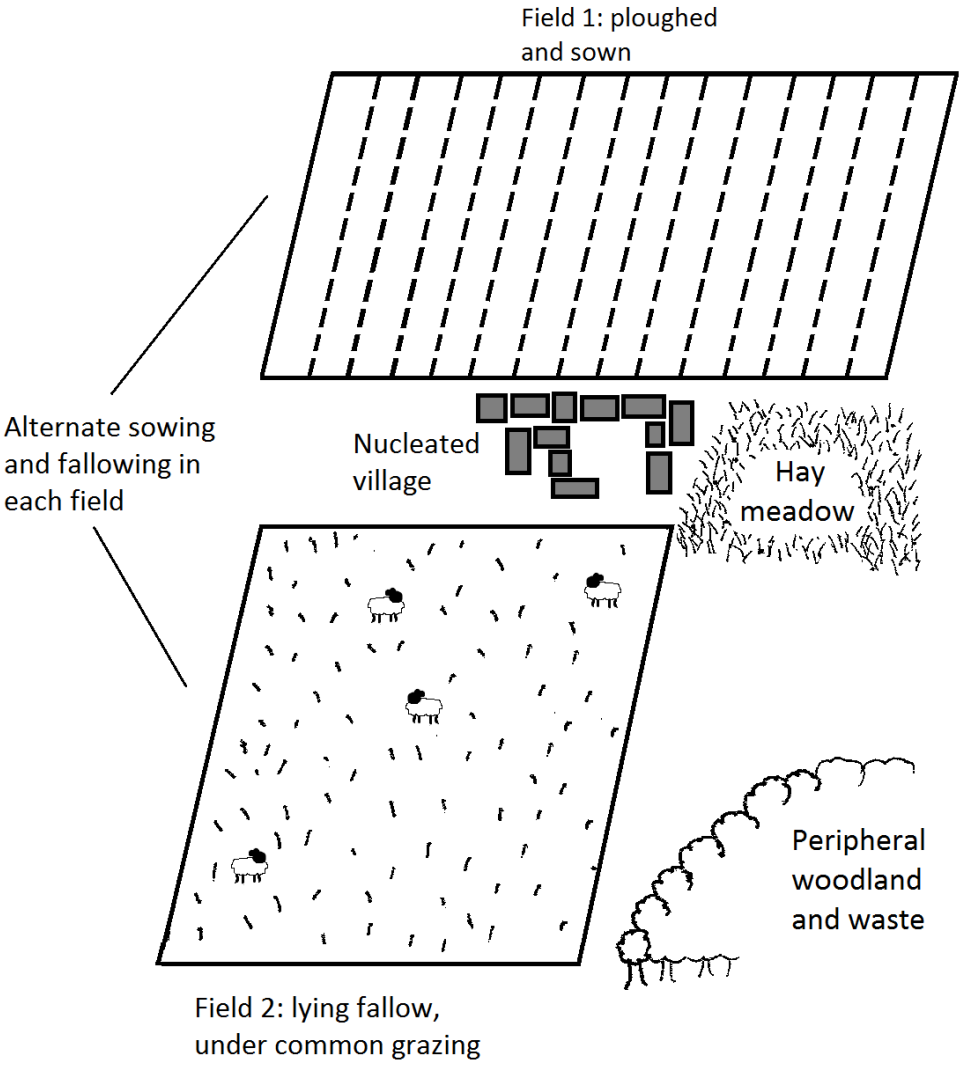


Figure 1.1 – Simplified schematic diagram of a 'two-field' open field system.

This model was consistent with the prevailing culture-historical paradigms of contemporary archaeological thought, yet it lacked all but the most circumstantial evidence for the supposed 'Germanisation' of the landscape, such as the prevalence of Old English as opposed to British place-names.[3]

From the 1960's onwards, the lack of secure evidence for Early Saxon nucleated villages, heavy ploughs, and open fields became increasingly conspicuous and problematic.[4] Moreover, with the

[3] *E.g.* Green 1885 p.138; 154.
[4] Wilson 1962 p.66; Finberg 1972 p.398.

decline of culture-historical approaches to archaeology in favour of processualist and later theories, the assumptions underlying the conventional model could no longer be relied upon. Thirsk's influential work argued that open field systems were probably the result of a protracted evolutionary process, stimulated in particular by demographic expansion in the 12th-13th centuries,[5] and until relatively recently, evidence for heavy ploughing and settlement nucleation was not apparent until the Late Saxon period (mid-9th to 11th centuries). Indeed, the Late Saxon period has continued to be seen by some scholars as the key period of agricultural development in Anglo-Saxon England.[6]

Meanwhile, revised studies of place-names, charters, and environmental evidence have cast increasing doubt on the traditional assumption that the earliest Anglo-Saxon immigrants were 'pioneers' in a heavily wooded landscape.[7] Palynological studies, especially the syntheses by Dark and Pears, have suggested that much of the British landscape was already open farmland by the end of the Roman period, and that in many areas (especially lowland regions) this open farmland persisted throughout the Early and Mid Saxon periods without any large-scale woodland regeneration (Figure 1.2).[8]

The identification of woodland regeneration in some more northerly and upland pollen sequences, particularly those in the region around Hadrian's Wall, has lent support to a new model of agricultural change in the 5th-6th centuries, in which the most influential factor was not the arrival of Germanic settlers but the collapse of Romano-British economic and administrative infrastructures. Neither the means (villa estates), nor the markets (urban centres and military garrisons), nor the exchange mechanisms (coinage, taxation, state-sponsored transport by land and sea) survived to maintain the large-scale agrarian output that had been required and sustained in Roman Britain. As a

[5] Thirsk 1964 pp.4–11; 24; *cf.* Titow 1965 pp.90–1; Homans 1969 p.32.
[6] *E.g.* Fowler 1976 pp.27–30; 44–6; Lewis *et al.* 1997 pp.202–23; Pryor 2010 pp.251–9.
[7] Murphy 1994 pp.35–6; O. Rackham 1994 pp.8–9.
[8] Dark 2000 pp.150–4; Esmonde Cleary 2011 p.23; Rippon *et al.* 2012 p.4.

result, the post-Roman agricultural economy entered a period of 'abatement', characterized by a shift away from high levels of arable productivity in favour of a greater emphasis on pastoralism.[9]

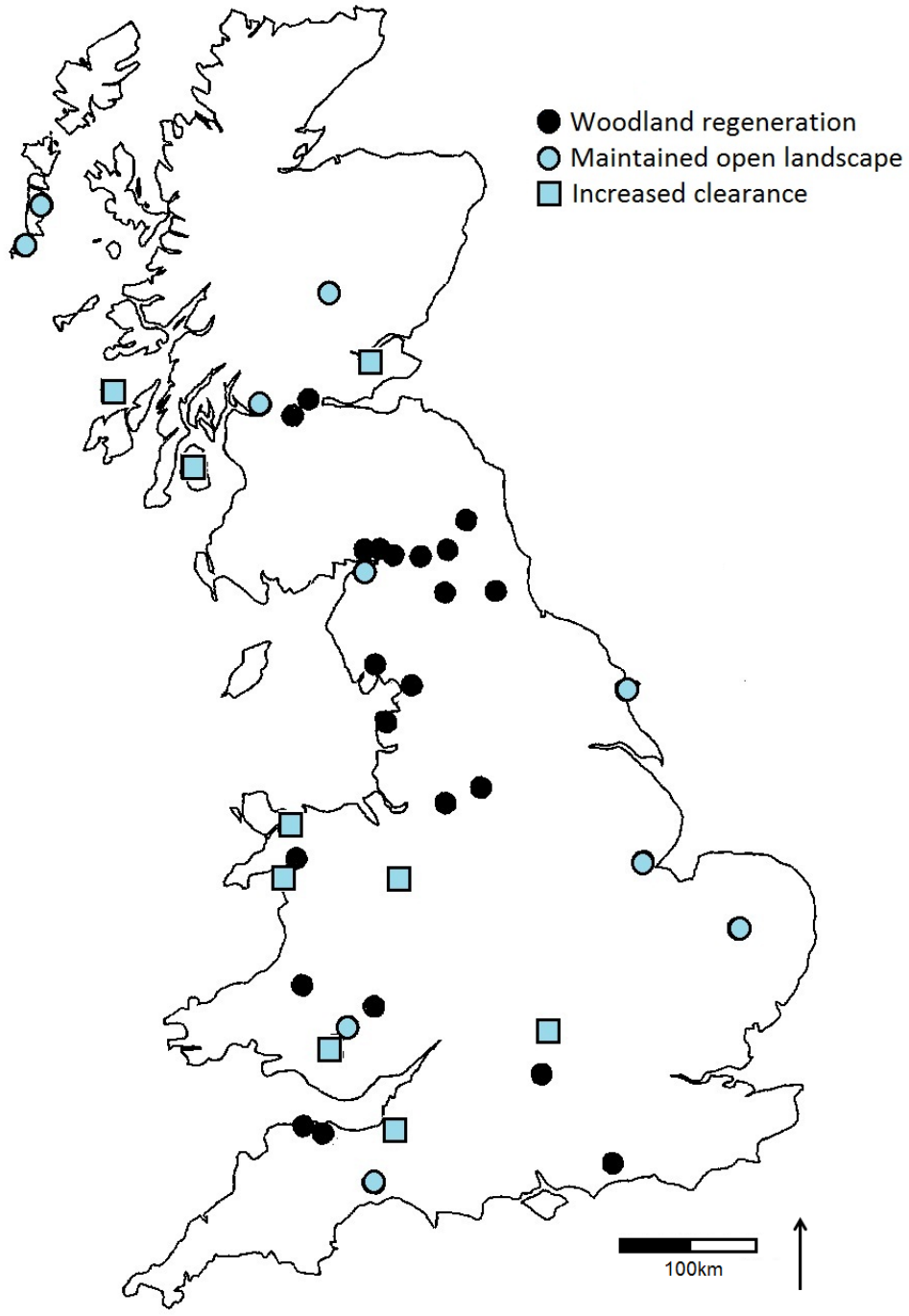


Figure 1.2 – Change and continuity in the post-Roman landscape, as suggested by pollen sequences spanning the 4th-5th centuries – after Dark 2000, 151, Fig. 5.6.

[9] Faith 2009 pp.24–6.

This is not to suggest that Early Saxon agricultural practices were stagnating and entirely devoid of innovation. Indeed, the apparent shift in emphasis towards pastoralism could be considered an active adaptation to changing circumstances, albeit one which did not entail enhanced productivity *sensu stricto*, since pastoral farming generally produces lower calorific returns per land-unit, in comparison with arable farming.[10] There are also likely to have been various minor modifications in farming practices throughout this period, the inevitable 'micro-inventions' discussed by van der Veen, implemented by individual farmers as needs and opportunities arose.[11] Palaeoenvironmental and archaeological research into the transition between Romano-British and post-Roman landscapes is currently being undertaken in the *Fields of Britannia* project at the University of Exeter, and the topic will not be directly addressed here.[12]

It is only from around the 7th century onwards that evidence begins to indicate plausible conditions for, and possible causes of, increasing agricultural productivity. Climatic change may be significant in this regard, but it is not currently understood in sufficient detail to be cited as a condition for agricultural change in this period. A range of evidence, including historical sources, ice cores and tree rings, suggests that cooler, wetter conditions prevailed from around the 5th century onwards, with warmer and drier conditions returning in the last quarter of the millennium, continuing (with much geographical and chronological variability) towards the so-called 'Medieval Warm Period'.[13] It has further been suggested that the rapidity of climatic change in the 5th and 6th centuries would have been so disruptive as to have had adverse effects on agricultural production.[14] However, since such climatic studies lack close chronological and geographical precision, it would be unwise to presuppose any specific, direct relationship between macroclimatic changes and agricultural conditions at a given place and time.

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[10] Spedding *et al.* 1981 p.355.
[11] van der Veen 2010 p.7.
[12] Rippon *et al.* 2012; Ben Pears pers. comm.
[13] Hughes & Diaz 1994; Dark 2000 pp.19–28.
[14] Büntgen *et al.* 2011 pp.578–82.

Demographic pressure has long been posited as a basic (though not necessarily sufficient) causal factor behind agricultural development and, although difficult to demonstrate conclusively, could be inferred from a general expansion of settlement patterns in the Mid Saxon period.[15] Besides a growing population, demands for greater agricultural surpluses could also have come from élites (demanding tribute/renders) and markets (requiring goods for trade and craft-production), both of which can be identified as potential stimuli in the Mid Saxon period.[16] The rise of a new élite from the late 6th and early 7th centuries, with evident command over labour and raw materials, is suggested by the occurrence of rich 'princely' burials and high-status settlements with large timber halls at around this time.[17] Specific demand for agricultural produce in the form of food-renders, associated with the stabilisation of political structures, is further attested by documentary sources such as the late 7th century laws of Ine of Wessex.[18] It has been suggested that monastic landlords, documented from the late 7th century onwards in surviving charters, may have exerted particularly strong pressure on Mid Saxon agricultural land in order to produce or procure special ecclesiastical goods (*e.g.* vellum for manuscripts, or Eucharistic wine).[19]

Another potential stimulus that could be identified in Mid Saxon England – namely, demand for marketable surpluses to support specialist craft and trade activity – is represented principally by the so-called wics or *emporia*: large, organized settlements such as Ipswich (Suffolk), with populations participating in long-distance exchange and craft production.[20] The non-agrarian populations of such settlements are thought to have depended upon surplus goods from rural producers, received via royal food-renders and/or goods-exchange. The possibility that farming communities utilized greater surpluses in order to participate in wider trade networks is raised by the

[15] Morrison 1994 pp.118–24; Hamerow 1999 p.417.
[16] Morrison 1994 p.125.
[17] Welch 2011 pp.269–75; Ulmschneider 2011 pp.159–60.
[18] *EHD* no.32, 70.1; Blinkhorn 1999 pp.12–3.
[19] *E.g.* Blair 2005 pp.251–61.
[20] Cowie 2001 p.17.

widespread rural distribution of artefacts such as silver *sceatta* coinage, Rhenish lava querns, and Ipswich Ware pottery throughout much of Mid Saxon England, extending beyond the immediate hinterlands of the wics.[21] The so-called 'productive sites', concentrations of coinage and other metalwork, often identified by metal-detector enthusiasts, may represent rural markets within this Mid Saxon exchange network.[22]

The impact of these new markets and élites upon Mid Saxon farming may have extended beyond their demands for greater surpluses: they might also have been directly conducive to agricultural development. For instance, the evidence for long-distance exchange implies intensified inter-regional contacts both within and beyond Mid Saxon England, suggesting a plausible historical context for the diffusion of new technologies, agricultural or otherwise.[23] The implementation of new technologies might also have depended upon the existence of supporting institutions, represented in Mid Saxon England by the growing power of secular and ecclesiastical landlords.[24] The stimulating influence of strong landlords may have been further enhanced by the introduction of 'bookland': estates held in perpetuity and recorded as such in charters. Monastic examples survive from the late 7th century onwards, secular cases from the late 8th century onwards. The formal longevity of these landholdings could well have encouraged long-term investments in productivity, although it should be noted that, by definition, we are poorly informed as to how bookland differed from other, undocumented forms of landholdings.[25]

The apparent reorganization of landholdings in Mid Saxon England is a controversial subject. One influential interpretation has been offered by Brown and Foard, who argue from field surveys and excavated evidence in Northamptonshire that settlement nucleation had occurred by *c*.AD 850, as part of a process of 'manorialization' whereby peasant cultivators lost their freedom to

[21] Blinkhorn 1999 pp.10–20; 2012 pp.87–99; Hamerow 2007 pp.225–6.
[22] Ulmschneider 2000 pp.100–4.
[23] Ruttan 1998 pp.158–9.
[24] Ruttan 1998 pp.161–2.
[25] Blair 2005 p.85; 129; Faith 1997 pp.159–61.

increasingly powerful landlords.[26] Although it is not the main subject of their discussion, they thus imply a model of agricultural development in which landowning élites were directly, purposefully instrumental in the reorganization of the productive landscape. The idea that the nucleated village may ultimately have Mid Saxon origins is reinforced by Reynolds' observation that rectilinear features – 'suggestive of imposed spatial regulation' – appear to be an innovation at Anglo-Saxon rural settlements from the late 6th/early 7th century onwards, and by Hamerow's related argument that Mid and Late Saxon settlements were often more stable than their more mobile, dispersed, and unenclosed Early Saxon predecessors.[27] The nucleation and stabilisation of rural settlements can be seen as directly conducive to agricultural development, since agricultural labour and technologies may be more effectively deployed if stable and centralized.[28]

1.3 Prospect

From the evidence and theories summarized above, one could propose an inductive case for agricultural development in the Mid Saxon period, perhaps beginning around the late 6th/early 7th century. The increasing power of a landholding élite, the structural reorganization of rural settlements and estates, a possible rise in population levels, and the growth in specialist craft production and long-distance exchange, all meant that enhanced agrarian productivity was both possible and desirable. The next chapter considers models of agricultural innovation which, according to recent scholarship, could have been adopted as part of the developmental process in Mid Saxon farming.

[26] Brown & Foard 1998 p.91.
[27] Reynolds 2003 pp.110–9; Hamerow 1991 p.17; 2012 pp.67–73.
[28] Williamson 2003 pp.67–68, 157.

2 Models of Agricultural Development

2.1 Introduction

The last decade has seen a growing recognition of the evidence for agricultural change in the Mid Saxon period, but there has been no targeted, synthetic study of Anglo-Saxon farming from an archaeological perspective.[29] As a prelude to such a synthesis, this chapter sets out a theoretical framework for the archaeological study of agricultural development, and offers a summary of the developmental models that have been proposed for Mid Saxon farming in recent literature. In this way, it aims to delineate the key areas of transformation that can be explored archaeologically, highlighting those which can most usefully be addressed in this study. The emphasis in this chapter is upon outlining current models and theories, which in subsequent chapters are critically examined in the light of newly collated datasets.

2.2 Defining agricultural development

It is beyond the scope of this study to attempt a detailed review of agricultural development studies *per se*, a field of economics which is largely concerned with models applicable to developing countries in the modern world. The use of certain heuristic concepts from this discipline in the following discussion is intended to facilitate the framing of the research design, rather than to imply direct parallels between modern economic processes and those of early medieval Britain.

Following Norton and Alwang, *agricultural development* is here defined as the process whereby agrarian productivity is increased through the stimulation of 'the basic sources of growth (labour, natural resources, capital, increases in scale or specialization, improved efficiency, and

[29] Moreland 2000 pp.80–104; Rippon 2010 pp.51–62; Hamerow 2012 pp.144–162 are important exceptions.

technological progress)'.[30] This concept is distinct from *agricultural innovations*, which may be defined as the ways in which, or the means by which, such stimulation was achieved. The general approach of this study is to identify a range of possible *innovations*, and then to consider the emergent patterns of agricultural *development* to which these various innovations contributed.

Agricultural development, as a process of economic growth, can be ideally modelled in terms of intensification and extensification. In this (admittedly simplified) dichotomy, *extensification* entails the physical expansion of agriculture over greater areas of land, with a relatively low input of labour per unit of land; whereas *intensification* aims to increase the productivity of a given plot through the greater investment of labour and other resources (such as manure) per land-unit.[31]

Agricultural innovations entail the transformation of various techniques, practices, tools and materials, which Evenson has classified in terms of five technologies: (i) crop-biological, (ii) animal-biological, (iii) chemical, (iv) mechanical, and (v) managerial.[32] Evenson's system offers a framework for assessing possible innovations in Anglo-Saxon agriculture, but it is recognized at the outset that the five technologies are closely interrelated and may in some cases overlap.

2.3 Crop-biological innovations

Crop-biological innovations are concerned with the range and relative importance of the crop species cultivated, and can be addressed primarily through archaeobotanical research. Although archaeobotanical data have been increasingly drawn upon in studies of Anglo-Saxon farming, small but significant misunderstandings are noticeable in some non-specialist works.[33] Specialist syntheses

[30] Norton & Alwang 1993 p.170.
[31] van der Veen & O'Connor 1998 pp.127–128; Bogaard 2004 p.21.
[32] Evenson 1974 p.52.
[33] *E.g.* Fowler 1999 p.22 describes *Triticum aestivum* (bread wheat) as 'einkorn', while Oosthuizen 2013 p.66 refers to charred seeds of henbane as 'pollen'.

have generally been lacking, although English Heritage's regional reviews are gradually making an important contribution.[34]

The (re)introduction of certain crop species can be considered a productive innovation if the crops in question are potentially higher-yielding, and/or of greater cultural or economic value, than those previously cultivated. Similarly, there might be shifts in emphasis within the existing crop spectrum, towards crop taxa of greater cultural or economic value.

Despite the dearth of synthetic archaeobotanical studies, several crop-biological innovations have been seen to characterize agricultural change between the 5th and 9th centuries, the most important of which concern the role of free-threshing wheat. According to the most widespread models, free-threshing bread-type wheat supplanted, firstly, spelt as the most important wheat crop of Anglo-Saxon England, and then hulled barley as the most important cereal crop overall.[35]

It is worth digressing here to set out the key differences between free-threshing and glume wheats. Free-threshing (or 'naked') wheats are those whose ears release their grains immediately upon threshing. Their most commonly preserved chaff elements in archaeobotanical deposits are rachis segments, typically counted as nodes or internodes. The grains of glume (or 'hulled') wheats, by contrast, remain tightly enclosed in their spikelets even when threshed, and require dehusking before they are released; the most commonly preserved chaff elements of glume wheats in archaeobotanical deposits are glume bases or spikelet forks.[36] It is often claimed that glume wheat spikelets must be parched, and the adhering glumes thus made brittle, before they can be dehusked. However, a critical review of historical, archaeological and experimental data has suggested that

[34] At the time of writing, the only regional review of plant macrofossil evidence that has been published is that for northern England (Hall & Huntley 2007). The sites covered in the forthcoming review for southern England overlap considerably with those in the study regions of this project (R. Pelling pers. comm.).
[35] Banham 2010 p.179; Moffett 2011 pp.348–351; Hamerow 2012 p.146.
[36] Hillman 1981 pp.131–137, Fig. 4-7; Boardman & Jones 1990.

parching is not, in fact, a necessary stage in the processing of glume wheats.[37] The term 'glume wheat' is here preferred to the synonymous 'hulled wheat', to avoid confusion with hulled varieties of oat and barley. Hulled oat and barley are free-threshing in the sense that their grains break free from their spikelets immediately upon threshing. However, they remain encased in the adherent lemma and palea, lighter chaff which can be removed in an additional processing stage, 'hulling'. The hulling of hulled varieties of oat and barley is in principle similar to the dehusking of glume wheats, but occupies a different place and purpose in the processing sequence (Figure 2.1).[38]

[37] Nesbitt & Samuel 1996 pp.42–48; Peña-Chocarro & Zapata 2003 pp.105–108.
[38] Cappers & Neef 2012 pp.248–251; Hillman 1981 pp.130–139.

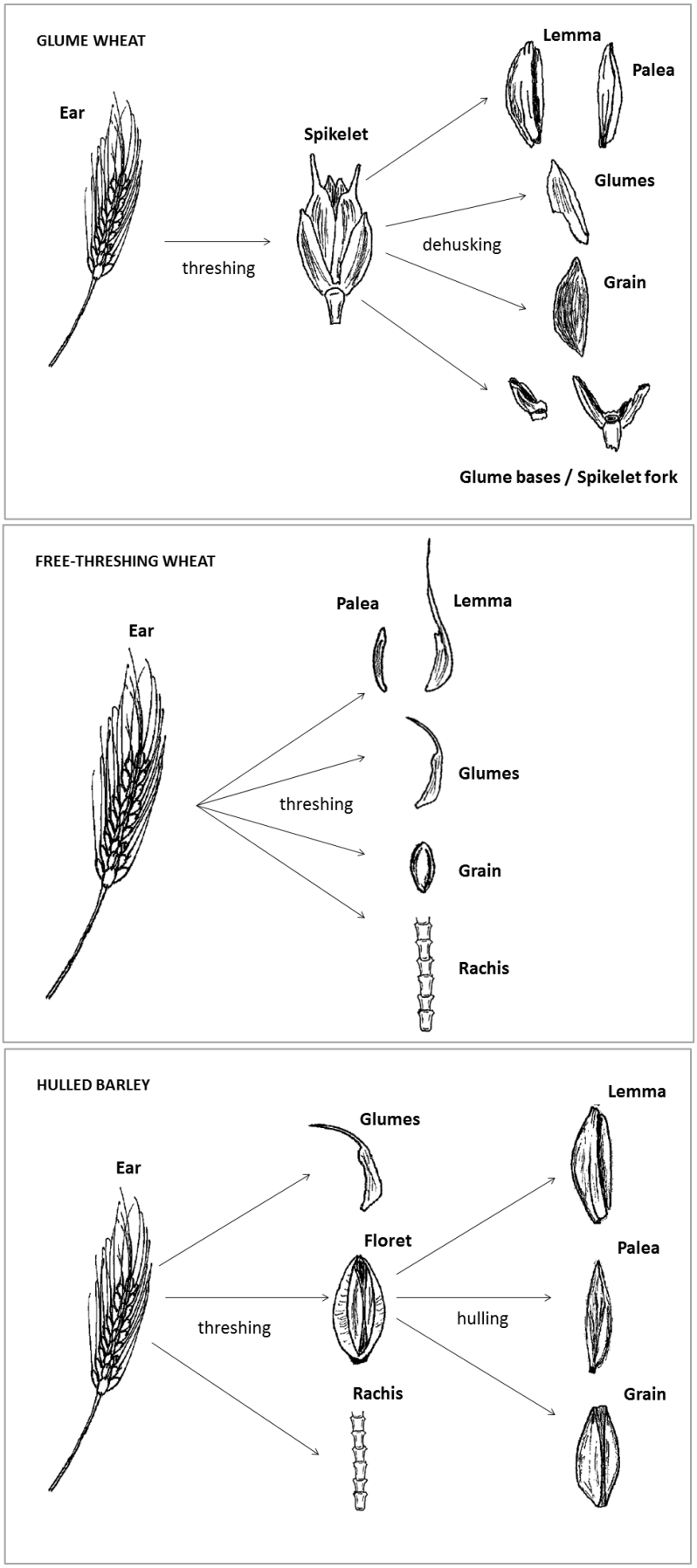


Figure 2.1 – Simplified explanatory diagram of the processing of (A) glume wheats, (B) free-threshing wheats and (C) hulled barley.

The main wheats discussed in this study are the glume wheats spelt and emmer, and the free-threshing bread and rivet wheats. Spelt and bread wheat are hexaploid, emmer and rivet wheat are tetraploid. Ploidy-level distinctions relate to numbers of chromosome sets, and have implications relating to, for example, drought-tolerance and culinary properties.[39] Since different varieties of free-threshing wheat are difficult to distinguish unless rachis segments are well-preserved, the generic term 'free-threshing wheat' will be used in much of the following discussion so as not to presume unwarranted ploidy-level distinctions. Specific allusions to bread wheat are made only in reference to the 'bread wheat thesis', discussed below.

It is widely accepted that, whereas spelt was the prevailing wheat crop of Roman Britain, free-threshing wheat came to replace it in the Anglo-Saxon period, but it remains an open question as to when, where, why, and how rapidly this change occurred.[40] Astill and Oosthuizen, for example, have dated this shift to around the 8th century, but the evidence for this chronology is not entirely clear.[41] It is more usually suggested, more or less implicitly, that the demise of spelt occurred fairly rapidly within the 5th-6th centuries, such that spelt macrofossils found within Early or Mid Saxon contexts are often taken to represent residual prehistoric or Roman activity.[42] Alternatively, in contexts where residuality is considered unlikely, the relatively low abundance of spelt macrofossils could suggest that it persisted in some places only as a minor crop, or perhaps a self-seeding volunteer in fields continuously cultivated since the Roman period.[43]

Emmer wheat was apparently a minor crop in Roman Britain but, according to Pelling and Robinson's argument, was reintroduced in the Early/Mid Saxon period, perhaps locally to the Thames valley and estuary as part of an imported agricultural tradition of the Saxon colonists. Their principal supporting evidence comprises glume bases from Dorney (Bucks), radiocarbon-dated to cal.AD 435-

[39] Moffett 1991, 233-4.
[40] *E.g.* Green 1981 p.133; Moffett 2011 p.349; Hamerow 2012 p.146.
[41] Astill 1997 p.199; Oosthuizen 2013 p.64 cites the more agnostic discussion by Moffett 2011 pp.348–351.
[42] *E.g.* Fryer in Atkins & Connor 2010 p.102; *cf*. Pelling 2003 p.103.
[43] *E.g.* Murphy 1994 p.37.

663; and from Yarnton, radiocarbon-dated to cal.AD 670-900. Without such radiocarbon determinations, an Early/Mid Saxon date for the emmer macrofossils might have been seriously questioned, given the widespread assumption that Anglo-Saxons did not grow glume wheats.[44]

In a more recent discussion, drawing extensively upon archaeobotanical discoveries in the Upper and Middle Thames valley (especially Yarnton), emmer has been cited along with rye, lentil, grape and plum as possible crop-biological innovations of the Mid Saxon period. According to this model, these crop-biological innovations were part of a process of 'agricultural recovery' in the Mid Saxon period, entailing the cultivation of a wider range of crops, agricultural and horticultural, than in the Early Saxon period. The authors thus posit innovation through *diversification*.[45] Rye and oats, in particular, may have become more important over the course of the Anglo-Saxon period.[46] It is unclear as to whether or not fibre crops such as flax and hemp should be considered as part of this diversification strategy. Oosthuizen implies that their production – 'on an industrial scale' – was a Mid Saxon innovation; whereas the authors of *Thames Through Time* simply state that flax 'remained common in waterlogged deposits' in both periods.[47]

In another model, developed primarily by Banham but with wider currency in Anglo-Saxon scholarship, one specific crop-biological innovation is held to characterize Anglo-Saxon agricultural development: the rise of bread wheat to become the dominant cereal crop in place of hulled barley. This model is here termed the 'bread wheat thesis.' It is related to, but distinct from, the observed demise of spelt wheat in favour of free-threshing varieties. It focuses upon the relationship between

[44] Pelling & Robinson 2000 p.119; Pelling 2003 pp.104–107.
[45] Booth *et al.* 2007 pp.329–36; Hamerow 2012 p.150.
[46] Banham 2010 p.179; Hamerow 2012 p.150.
[47] Oosthuizen 2013 p.64; Booth *et al.* 2007 p.330.

barley and bread wheat, and argues that barley was the most important cereal crop of the Early Saxon period, but that bread wheat rose to dominance from the Mid Saxon period onwards.[48]

Ultimately, this model has its origins in Jessen and Helbaek's landmark study of ceramic grain impressions, published in 1944. In the prolonged absence of new data, their dataset was cautiously accepted as the primary archaeological basis for understanding Early Saxon crop husbandry in subsequent decades, until new archaeobotanical data were accumulated and analysed in the late 1970's, as in Monk's dissertation of 1977.[49] An updated national synthesis of plant macrofossil data was produced in 1990 by Debby Banham, who found that barley was more common than wheat in the Early Saxon period, but that wheat was more common that barley by the Mid Saxon period – trends which echoed those previously observed by Monk.[50] Most of the wheat in question was positively identified as free-threshing bread-type wheat, and Banham has therefore suggested that a dietary preference for wheat bread over barley bread was ultimately responsible for the change in the relative importance of the two cereals.[51] Other possible advantages of free-threshing wheat over hulled barley or spelt, that could render its cultivation a 'productive' innovation, include ease of processing (*i.e.* it does not need dehusking/hulling), winter-hardiness, and potentially greater productivity with the more intensive input of labour and manure. However, as Moffett has argued, none of these factors is incontrovertible or necessarily exclusive to free-threshing wheats; and none alone would necessarily explain why free-threshing wheats, although known in Britain since the Neolithic, only achieved predominance from the Anglo-Saxon period onwards.[52]

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[48] See, *e.g.* Fowler 1981 p.279; Banham 1999 p.190; 2003 p.121; 2004 pp.13–14; Hagen 2006 pp.33–35; Hamerow 2002 p.153; 2007 p.225; Oosthuizen 2013 p.64.
[49] Jessen & Helbaek 1944 p.27, Table 1; Wilson 1962 pp.67–68; Finberg 1972 pp.420–422; Godwin 1975 pp.405–415; Monk 1977 pp.332-340.
[50] Banham 1990 p.38; reiterated by Banham 2010 p.179.
[51] Banham 2010 p.179.
[52] Moffett 2011 pp.349–350.

Finally it may be noted, by way of contrast to the 'bread wheat thesis,' that Murphy identifies barley as the dominant cereal crop of the reoccupied Fens in the Mid Saxon period, plausibly because of its tolerance of saline environments.[53]

2.4 Animal-biological innovations

There is unlikely to have been any major change in the range of livestock species kept during this period: cattle, ovicaprids, and pigs remain the most common domesticates in faunal assemblages throughout the Roman, Anglo-Saxon and medieval periods.[54] *Ovicaprid* is used throughout this study as an umbrella term for sheep and goat, whose skeletal remains are seldom distinguishable.

Changes in the relative importance of different species of livestock between the Early and Mid Saxon periods, as inferred from zooarchaeological patterns in taxonomic abundance, could potentially reflect animal-biological innovations. Crabtree and Hamerow have highlighted a general (though not universal) increase in the proportion of sheep relative to cattle and pigs, especially in areas of eastern England, in the Mid Saxon period.[55] Sykes, by contrast, has stressed that Mid Saxon agriculture nonetheless generally placed a greater emphasis on cattle, which were needed to provide manure and traction in a period of intensive arable production. According to Sykes, sheep only became more important after the Norman Conquest, except at a few 'precocious' Early/Mid Saxon sites in Oxfordshire and Buckinghamshire.[56] Differences in methodology and emphasis may account for the discrepancy between these two models.

Besides possible shifts in emphasis between particular species, there may well have been some specialization in particular animal *products*. It has been argued that while the age and sex profiles of Early Saxon assemblages are generally consistent with a broad-based strategy of self-sufficiency,

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[53] Murphy 2010 p.215.
[54] Fowler 2002 p.223; Sykes 2006 p.56; Booth *et al.* 2007 p.330.
[55] Hamerow 2002 p.148; 2012 pp.156–157; Crabtree 2010 p.127; cf. Crabtree 2012 p.58.
[56] Sykes 2006 pp.57–8; Sykes in Preston 2007 pp.107–8.

those of Mid Saxon assemblages often tend towards specialization – usually with more animals kept into maturity so as to continue providing secondary products (milk, traction, manure, and wool) throughout their working lives.[57] Given also the possible rise in sheep husbandry in this period, wool production has sometimes been highlighted as a particularly important Mid Saxon specialization; wool flocks have been inferred, for example, from the relatively high proportions of mature wethers (male castrates) at Southampton and Brandon.[58]

Biometric data, meanwhile, could potentially indicate genetic innovation (selective breeding). For example, Crabtree noted that the sheep from Mid Saxon Brandon were generally smaller than those from Early Saxon West Stow, which 'may reflect the introduction of a new breed… possibly a specialized wool producer'.[59] There is also an apparent increase in the size of cattle in the Mid Saxon period at Flixborough (Lincs), whose cattle are of unprecedented size.[60]

In addition, the identification of pathological traits could have important pastoral implications. For example, the increased occurrence of 'penning elbow' among Flixborough's sheep in the 9th century could indicate the use of stock-pens, although the causes of this condition are neither certain nor exclusive. The same is true, for example, of 'traction pathologies' in cattle, instances of which could perhaps be related to changes in ploughing practices, although the link remains to be explored in further detail.[61]

2.5 Chemical innovations

Chemical innovations concern the edaphic conditions of arable production, and could have entailed such techniques as crop rotation, fallowing, and the use of heavier, more fertile soils. A Mid Saxon shift in settlement patterns, involving the reoccupation of heavy clay soils for the first time

[57] Crabtree 1996a; 2010 p.131; 2012 pp.57–59; Hamerow 2002 pp.150–1; Sykes 2006 pp.57–8.
[58] Bourdillon & Coy 1980 pp.109–10; Crabtree 2007 pp.167–8.
[59] Crabtree 1996b; 2012 p.56.
[60] Dobney *et al.* 2007 pp.160–5.
[61] O'Connor 2000 p.105; Dobney *et al.* 2007 pp.184–5.

since the Roman period, has long been recognized from both excavated evidence and field surveys, for example in the Sandlings area of Suffolk.[62] That these soils were also cultivated rather than just grazed has been inferred, for example at Yarnton, from the increased occurrence of stinking chamomile (*Anthemis cotula* L.) – an arable weed characteristic of heavier soils – amongst Mid Saxon crop remains.[63]

In terms of maintaining soil fertility, large quantities of manure might well have been available in the Mid Saxon period, if livestock was increasingly being kept to a greater age (as discussed above); and indirect evidence of middening might be found in the occurrence of weed species such as henbane (*Hyoscyamus niger* L.), which is characteristic of middens, again in crop assemblages at Yarnton.[64] Henbane is not, however, exclusive to middens: it is a nitrophilous species that might equally thrive in other 'disturbed and enriched' soils, such as those alongside bridleways/droveways – which again are possible innovations of the Mid Saxon period.[65]

Weed ecology therefore provides a sensitive way of exploring chemical innovations but, with a few exceptions such as the work at Yarnton, this approach has yet to be applied to many archaeobotanical assemblages of Anglo-Saxon date. In addition, it would be preferable to consider weed floras in their entirety, rather than relying upon individual species as indicators of environmental characteristics, since the latter approach is more vulnerable to bias through chance occurrences and diachronic changes in individual species' ecological attributes.[66]

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[62] Arnold & Wardle 1981 pp.145–149; Hodges 1989 p.62; Newman 1992 pp.30–35, figs.5-8.
[63] Stevens in Hey 2004, p.362.
[64] Hey 2004 pp.48–9.
[65] Cappers & Neef 2012 p.111; see below, §2.7.
[66] G. Jones 1992 pp.136–137.

2.6 Mechanical innovations

There are three main mechanical technologies that have been proposed as Mid Saxon innovations in recent studies, one relating directly to agricultural production (heavy ploughs) and two relating to agricultural processing (watermills and grain ovens).

The heavy plough is distinguished from the ard (the lighter 'scratch plough') by the addition of a coulter to slice the soil vertically and, at least in the developed form of the heavy plough, a mouldboard to invert the sod (Figure 2.2).[67]

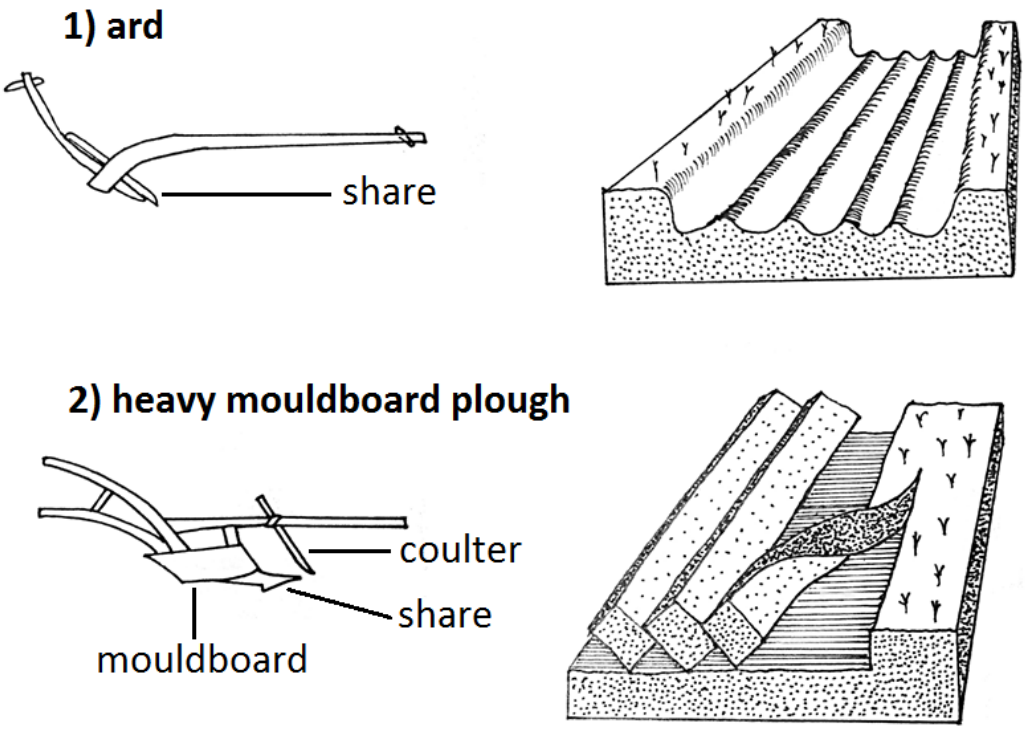


Figure 2.2 – Simplified comparison of ploughs – after Bowen 1961 p.8, Fig. 1.

Artefactual and plough-mark evidence for heavy ploughing has long been known from the Late Saxon period, and a form of heavy plough (if not a true mouldboard plough) seems to have existed in Roman Britain.[68] In addition, an iron coulter from a swivel plough, a variety of mouldboard plough,

[67] Bowen 1961 pp.7–11.
[68] Hill 2000 pp.11–13; Fowler 2002 pp.152–3; Williamson 2003 p.120; Booth *et al.* 2007 p.288.

has recently been discovered in an early 7th century context at Lyminge (Kent): to date, a uniquely early instance in Anglo-Saxon England.[69] The (re)introduction of heavy ploughing by the Mid Saxon period might in any case have been inferred from the reoccupation of heavy clay soils, noted above, since according to Williamson these soils could not have been effectively cultivated without a heavy plough, [70] although they might conceivably still have been grazed in the Early Saxon period. The weed spectra in the crop assemblages at Yarnton have also been used as an index of heavy ploughing, since species which are more tolerant of soil-disturbance (mostly annuals) are seen to increase in the Mid Saxon period, while those which are less tolerant of disturbance (mostly perennials) decline.[71] More specifically, M. Jones has argued that a decline in common chickweed (*Stellaria media* (L.) Vill.) and bromes (*Bromus* L.) and a rise in stinking chamomile (*Anthemis cotula* L.) and cornflower (*Centaurea cyanus* L.) at Mid Saxon Pennyland might reflect a shift from 'shallow' to 'deep cultivation' and so, by implication, from ards to heavy ploughs. The argument is based partly upon the dormancy of these species' seeds, and their ability to germinate despite soil disturbance.[72]

These weed-based inferences are, however, open to alternative interpretations. For instance, Stevens suggests that the dominance of annual species at Mid Saxon Yarnton could reflect more continuous ploughing, rather than (necessarily) deeper ploughing, although the two interpretations are not mutually exclusive.[73] Experimental work on the impact of different ploughing regimes on arable weed flora remains to be conducted, but is beyond the scope of this study.

Evidence for Mid Saxon innovation in processing technologies is limited. The earliest known post-Roman watermills – for example, at Worgret (Dorset) – are dated to the late 7th and early 8th centuries, and thus on current evidence appear to represent a Mid Saxon innovation, involving a

[69] Pitts 2011 p.7; G. Thomas & J. Henning pers. comm.
[70] Williamson 2003 p.121.
[71] Stevens in Hey 2004 pp.363–4.
[72] M. Jones in Williams 1993 pp.173–174; M. Jones 2009.
[73] Stevens in Hey 2004 p.364.

considerable investment of labour and resources, and probably reflecting an increased scale of arable production which required larger-scale processing facilities.[74]

As Hamerow has identified, the same appears to be true of grain ovens, purpose-built for the drying and/or malting of cereal grain: Romano-British examples seem to have fallen out of use in the 5th century, and new constructions appear only from the Mid Saxon period onwards, *e.g.* a malting oven containing the remains of germinating cereal grain at the supposed tribute-collection centre at Higham Ferrers (Northants).[75] Again, this trend may be indicative of greater crop yields in the Mid Saxon period.

2.7 Managerial innovations

Managerial innovation can embrace a variety of changes, some of which have already been touched upon in the previous chapter, *e.g.* settlement nucleation, reorganization of landholdings, and large-scale mobilization of resources for tribute and/or trade. A more general managerial innovation that has been postulated in the Mid Saxon period is the expansion of arable production at the expense of pastoralism, as suggested by the appearance of larger-scale facilities for the processing and storage of crops. Specialist grain-storage facilities do seem to be an innovation of this period, like watermills and grain ovens, although very few are currently known and there is no evident typology.[76]

Arable expansion has otherwise been deduced from palaeoenvironmental evidence, *e.g.* from pollen sequences in which proportions of cereal pollen increase notably from the Mid Saxon period onwards; and more generally from the greater abundance of cereal remains among charred

[74] Watts 2002 pp.72–82.
[75] Hamerow 2012 pp.151–152; Hardy *et al.* 2007 pp.48–54.
[76] Hamerow 2011a; 2012 p.152.

macrofossils at Yarnton.[77] Palaeohydrological evidence is also suggestive of arable expansion from the later Mid Saxon period onwards: alluviation, presumed to reflect soil-erosion consequent on the extension of ploughed land, is seen to increase from around the 9th century in the Nene and Upper Thames valleys, for example.[78]

If arable expansion did occur, with pasturage consequently reduced, then the maintenance of livestock could have depended increasingly upon the efficient management of hay meadows for the provision of winter fodder. Robinson's study of the waterlogged insect remains from Oxey Mead has provided evidence of hay meadow management in the vicinity of Yarnton, probably beginning in the Mid Saxon period.[79] Greater control over livestock might also be inferred from the construction of droveways and paddock-like enclosures in the Mid Saxon period at sites such as Riby Cross Roads (Lincs).[80]

Most fundamentally, whole new agricultural systems may have been instituted in this period. For example, a regime known as 'convertible husbandry', which entailed long-term rotations between cereal and grass crops, has been identified in a palynological study of 7th-9th century Devon.[81] Oosthuizen meanwhile, through a study of landscape archaeology, documentary sources, and the wider historical context, has dated a 'proto-open-field' arrangement in the Bourn Valley (Cambs) to the Mid Saxon period.[82]

Additionally, Banham's 'bread wheat thesis' might have further implications in terms of managerial innovation. Banham contends that bread-type wheat would largely have been autumn-sown, whereas barley would have been spring-sown. The perceived increase in bread wheat cultivation in the Mid Saxon period would therefore have entailed a shift in the seasonality of sowing

[77] Rippon 2010 p.58; Booth *et al.* 2007 p.333.
[78] Brown & Foard 1998 pp.81–2; Robinson 1992a pp.205–6; Booth *et al.* 2007 pp.19–20.
[79] Robinson 2011 p.53.
[80] Blinkhorn 1999 p.14.
[81] Rippon *et al.* 2006 p.55.
[82] Oosthuizen 2005, 176-88.

regimes. Moreover, it is suggested that, in order to facilitate the survival and success of bread wheat in wet winter soils, better drainage could have been afforded by heavy ploughing and its resultant ridge-and-furrow patterns; open field systems may have been the ultimate result.[83] This argument has been criticised for its mono-causality, however,[84] and it should be stressed that free-threshing wheat and hulled barley need not be exclusively sown in the autumn and spring respectively.[85]

2.8 Prospect

Such are the principal agricultural innovations that have been identified or proposed in recent archaeological studies. Four key themes have emerged: (i) arable expansion and the associated rise in crop processing and storage facilities; (ii) diversification and new emphases in crop spectra; (iii) new techniques and strategies in crop husbandry, *e.g.* in manuring, sowing, and ploughing regimes; and (iv) specialization in animal husbandry, especially with regard to secondary products and sheep's wool in particular. Yet in many cases, current models are based upon material from very few sites, or upon datasets that are in urgent need of updating. Much further light could be shed on these topics by the systematic compilation of a new archaeological dataset, comprising bioarchaeological and settlement evidence pertaining to agriculture. Such is the aim of the current project.

[83] Banham 2010 pp.182–7.
[84] Thomas 2011a p.345.
[85] See further below, §6.7.2 on crops and seasonality.

3 Methodology

3.1 Introduction

This chapter outlines the methodological basis for the collection, organization and analysis of archaeological data, the results of which constitute the core of this thesis. The methods described in this chapter were applied to secondary, *i.e.* pre-existing, data. The methodological basis for the primary analysis of charred plant remains from Lyminge is described separately.[86]

3.2 Data collection

3.2.1 Regional parameters

Given the potential influence of regional variability upon patterns of agricultural development, it was considered that this investigation would benefit from a comparative approach, drawing upon evidence from two regions which encompass different landscapes and environments, so that the impact of such differences could be assessed. A fair comparison also requires that the regions share a similar abundance of archaeological evidence for the Early and Mid Saxon periods. Background research suggested that the following regions, arbitrarily defined as units of manageable size, would be suitable as case studies (Figure 3.1): Region 1, the Upper and Middle Thames valley and environs; and Region 2, East Anglia and Essex.

The regions' boundaries were defined in terms of post-1970 administrative counties and unitary authorities, in order to facilitate research via Historic Environment Records; they do not necessarily have any intrinsic environmental or historical significance (Figure 3.2).

[86] Appendix 3.

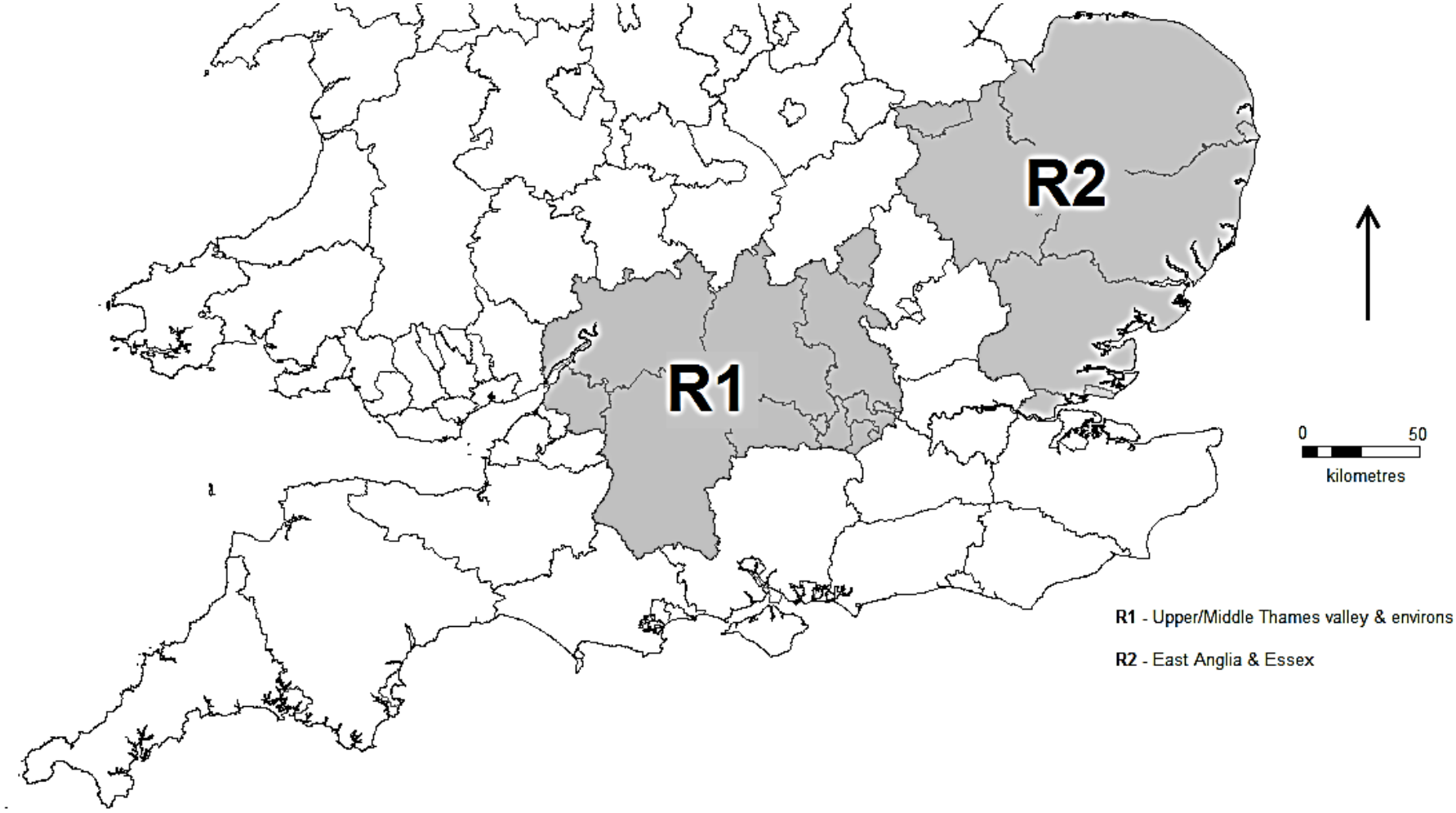


Figure 3.1 – Case study regions located within southern Britain (Digital Mapping Data © Collins Bartholomew 1995).

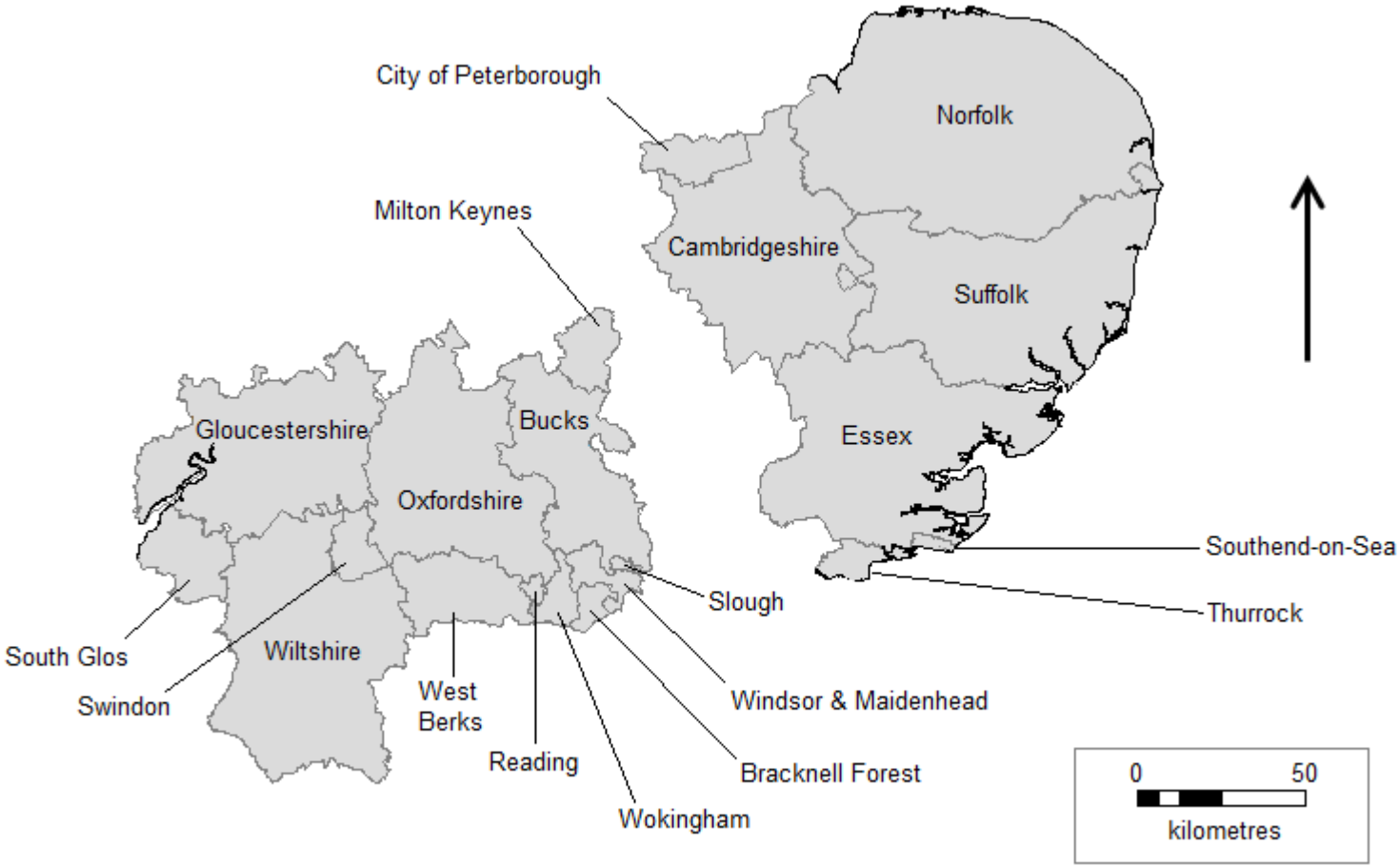


Figure 3.2 – Modern administrative geography of the study regions (Digital Mapping Data © Collins Bartholomew 1995).

These regions incorporate considerable topographical variety, including, for example, inland and coastal landscapes, chalk downs and river gravels, hills and fens.[87] Moreover, excavations in these regions have discovered relatively large numbers of Anglo-Saxon settlements. As the corpus of known sites continues to grow through development-led excavations, the archaeological authenticity of an Anglo-Saxon culture zone in southern Britain centred on the Great Ouse and Upper Thames valleys has become increasingly convincing.[88]

In addition, the opportunity arose for the author to undertake primary analysis of a sub-assemblage of charred plant remains from on-going excavations at Lyminge (Kent).[89] Despite lying beyond the selected study regions, Lyminge was deemed worthy of inclusion in this study because of both its documented status as a minster in the Mid Saxon period and the excellent state of preservation at the site. The sub-assemblage belongs to the site's 8th-9th century monastic phase, and derives from an area provisionally identified as an agricultural processing zone. It thus afforded a rare opportunity to consider crop and weed spectra from a known monastic estate centre, against a plausible backdrop of functional zoning. Hence, it may shed light on the crop-biological and managerial innovations employed in Mid Saxon agriculture by one of the new landed minsters, which were characteristic of the period and would have been well-placed to invest in agrarian productivity, as discussed above.[90]

[87] See below, §§4.2–4.3.
[88] Hamerow 2011b p.120; 2012 p.4, Fig.1.1; Blair 2013a pp.5-8.
[89] See Appendix 3. I am grateful to Dr Gabor Thomas, University of Reading, for the opportunity to examine this sub-assemblage.
[90] See above, §1.2.

3.2.2 Data types

A multitude of sources can be drawn upon in the archaeological study of agricultural development, and it is beyond the scope of this study to collate and analyse all pertinent datasets. The main focus here is therefore upon three categories of data which are relatively abundant and well-recorded in excavation reports; are appropriate to an inter-site comparative study but currently lacking up-to-date syntheses; and are also relatively familiar to the author through prior training and research: (i) settlement remains, (ii) animal bones, and (iii) plant macrofossils. Other categories of archaeological and palaeoenvironmental data (*e.g.* pollen sequences, iron artefacts) were considered when encountered in the course of research, but have not been subjected to extensive original analysis.[91]

3.2.3 Data collection strategy

Data collection was initiated through the consultation of resource assessments, research agendas, fieldwork summaries in journals, and online databases (Table 3.1). From these sources, excavated sites with 5th- to 9th-century settlement remains were identified and noted. References were then pursued in published and unpublished sources, and pertinent data recorded in spreadsheets (MS Excel). Relevant images, such as plans of settlement remains, were reproduced where available. An arbitrary threshold was set such that excavation reports predating 1970 were generally not utilized, since before this date many excavations will not have been conducted to modern scientific standards, nor will bioarchaeological remains have been systematically recovered from Anglo-Saxon settlements.[92]

In several instances, where relevant data were unpublished, or published in insufficient detail, archive reports were sought directly from the excavators, environmental analysts, or the Historic Environment Records maintained by local authorities.

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[91] See below, §4.6.
[92] Fowler 1976 pp.46–47.

Data collection ceased in the spring of 2012 when it was judged that the majority of accessible excavation reports had been studied, and that further research was resulting in rapidly diminishing returns. It was not possible to locate reports for all excavations. For some sites, *e.g.* Abingdon Vineyard (Oxon), references were highly elusive and the attempt was abandoned. For others, *e.g.* Horcott Quarry (Glos), post-excavation work remained incomplete at the time of enquiry. Hence the final dataset cannot be considered complete or truly comprehensive. Samples from graves and 'off-site' bioarchaeological data, *e.g.* from isolated palaeochannels, were deliberately omitted from the dataset, partly because of their less straightforward relationship to human settlement activity, but also to place practical limits on the scope of the investigation. As with palynological data, however, such evidence was considered where encountered in the course of research.

Table 3.1 – Initial sources for data collection (online resources last accessed July 2012).

	Journals	**Books/reports**	**Websites**
Region 1	South Midlands Archaeology, 1971-2009	Booth *et al.* 2007	-
Oxon	Oxoniensia, 1970-2010	Blair 1994; Crawford & Dodd 2007	Oxfordshire Heritage Search, <www.oxfordshire.gov.uk/heritage>
Bucks	Records of Buckinghamshire, 1970-2010	Farley 2008	Unlocking Buckinghamshire's Past, <ubp.buckscc.gov.uk>
Berks	Berkshire Archaeological Journal, 1970-2009	Clark 2007	-
Glos	Transactions of the Bristol & Gloucestershire Archaeological Society, 1970-2009	Heighway 1987	-
	Glevensis, 1970-2010	-	-
Wilts	The Wiltshire Archaeological & Natural History Magazine, 1970-2010	Draper 2006	-
Region 2	-	Medlycott 2011; Wade 1997	-
Cambs	Proceedings of the Cambridge Antiquarian Society, 1970-2010	-	-
Essex	Transactions of the Essex Archaeological Society, 1970-2009	-	Unlocking Essex's Past, <unlockingessex.essexcc.gov.uk>
Norfolk	Norfolk Archaeology, 1970-2010	Chester-Kadwell 2009	Norfolk Heritage Explorer, <www.heritage.norfolk.gov.uk>
Suffolk	Proceedings of the Suffolk Institute of Archaeology & History, 1970-2010	-	-
National	Medieval Archaeology, 1970-2010	Rahtz 1976	Pastscape, <www.pastscape.org>
	Medieval Settlement Research Group Annual Report, 1986-2009	Hamerow 2012	ADS Grey Literature Library, <archaeologydataservice.ac.uk/archives/view/greylit>
			Heritage Gateway <www.heritagegateway.org.uk >
			Oxford Archaeology Report Library, <library.thehumanjourney.net>
			Thames Valley Archaeological Services Archive, <www.tvas.co.uk/reports/reports.asp>
			Wessex Archaeology Reports, <www.wessexarch.co.uk/reports>

3.3 Site attribute data

Besides the specific data pertaining to structural, faunal and botanical remains, general site attribute data were also recorded. Geographical locations were recorded using National Grid References (NGRs), so that spatial patterns in the data could be explored; if not explicitly stated in an excavation report, NGRs were obtained from HERs or read from site plans. Underlying geology was recorded because, as a parent material of local soils, it is likely to have affected both archaeological preservation conditions and past agricultural environments.[93] Where geological information was not available in excavation reports, the British Geological Survey's online *Geology Roam* facility, accessed via the EDINA Digimap service, was consulted.[94]

Topography may likewise have been an important factor in determining the growing and grazing conditions around a particular site, but is harder to define in a standardized fashion. One aspect of topography that can be standardized is elevation (in metres above Ordnance Datum) which, if not provided in excavation reports, was obtained from Ordnance Survey maps, again accessible via Digimap.

While local geology and topography are important, a settlement's agricultural activities are likely to have extended beyond its immediate vicinity and into other terrains, if only occasionally or seasonally. To allow for this possibility, site distributions were also considered within the context of Natural Areas (NAs) and National Character Areas (NCAs). These frameworks were devised in the 1990's by *English Nature* (now *Natural England*) and are being revised at the time of writing. They define areas with similar landscape characteristics, constituting 'biogeographic zones that reflect the geological foundation, the natural systems and processes and the wildlife in

[93] Goldberg & Macphail 2006, 60.
[94] <http://digimap.edina.ac.uk>, accessed June 2013.

different parts of England,' thus transcending the boundaries of modern administrative units.[95] It should be remembered, however, that they are based upon modern observations and should be treated as such: past environments need not be expected to correspond exactly with those described by *Natural England*, although certain geological attributes may have remained constant. Descriptive profiles and GIS mapping data for NAs and NCAs are accessible online, and form the basis of much of the discussion in Chapter 4.[96]

Site attributes, along with plans, summary descriptions and bibliographical references are provided in a gazetteer organized by county.[97] The alphanumeric codes used in the gazetteer, *e.g.* 'NO5' for Terrington St Clement (Norfolk), are used in this study as a concise means of referencing sites in the dataset.

3.4 Structural remains

The key agricultural structures of interest in this study are grain ovens, watermills, and storage facilities such as barns and granaries. In addition, certain settlement morphological features may be of agricultural significance: raised causeways that may have facilitated herding over wetlands; ditched droveways or trackways; and boundary features that could have delineated fields, paddocks, or similar agricultural enclosures. All features which have been ascribed any of these functions in the available literature were recorded in the project dataset, along with dimensions, descriptions, dating evidence, reasons for interpretation, and images where available. Published interpretations and dates of structures are not necessarily endorsed by their inclusion in the dataset. Rather, they are collated and subjected to critical analysis in Chapters 5 and 7.

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[95] Webster 2008, 3.
[96] <www.naturalengland.org.uk>, accessed June 2013.
[97] Appendix 1.

3.5 Dating of bioarchaeological remains

Whereas the dating evidence for individual structures was critically assessed on a case-by-case basis, the sheer number of faunal and botanical assemblages necessitated a more generalized approach to the dating of bioarchaeological material. In the vast majority of cases, bioarchaeological deposits were not directly dated in excavation reports but were rather assigned to one or more phases within the generalized chronological sequences of individual sites. Clearly this is problematic, since it creates somewhat artificial populations of flora and fauna which are time-averaged in terms of centuries, blurring any diachronic developments that may have occurred over shorter timescales. Moreover, the common assumption that bioarchaeological remains are contemporary with stratigraphically associated artefacts may be misleading, especially in the case of tertiary deposits which may represent the accumulation of several depositional events over an extended period.[98] Such problems are compounded by the fact that ceramic chronologies for the Anglo-Saxon period are regionally variable and generally of poor definition. For example, while Ipswich Ware is a near-ubiquitous indicator of 8th-9th century dates in much of East Anglia, parts of the Upper Thames valley may have been essentially aceramic at this time.[99] Even where animal bones and plant remains have been radiocarbon dated, these determinations frequently span two or more centuries, and dates produced prior to the publication of widely-accepted calibration curves in the 1980's and 1990's might not be reliable.[100]

In light of these difficulties and ambiguities, it was decided to assign faunal and botanical assemblages, with as much precision as available data allowed, to five broad and overlapping chronological categories based upon scientific dating results (especially radiocarbon) and

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[98] *E.g.* the backfills of some *Grubenhäuser* according to Tipper 2004 pp.157–159.
[99] Blinkhorn in Hardy *et al.* 2003 p.172; *cf.* Mellor 1994 pp.36–37.
[100] Pollard 2009 p.154.

stratigraphic associations with artefacts and settlement features. The intention is to allow at least a relative chronology – an ordinal progression – so that possible developmental sequences may be examined, even if the absolute dating of particular developments remains imprecise. It is based upon the conventional division between Early (*c.*AD 410-650) and Mid Saxon (*c.*AD 650-850), but attempts a slighter greater degree of precision by accounting for Blinkhorn's refined chronology for Ipswich Ware and observations by Hamerow and Reynolds on developments in settlement morphology. It thus attempts to define *Early Saxon* (*c.*AD 410 – *c.*AD 650), *Intermediate* (*c.*AD 600 – *c.*AD 850), and *Mid Saxon* (*c.*AD 720 – *c.*AD 850+) categories; the system is summarized in Figure 3.3.

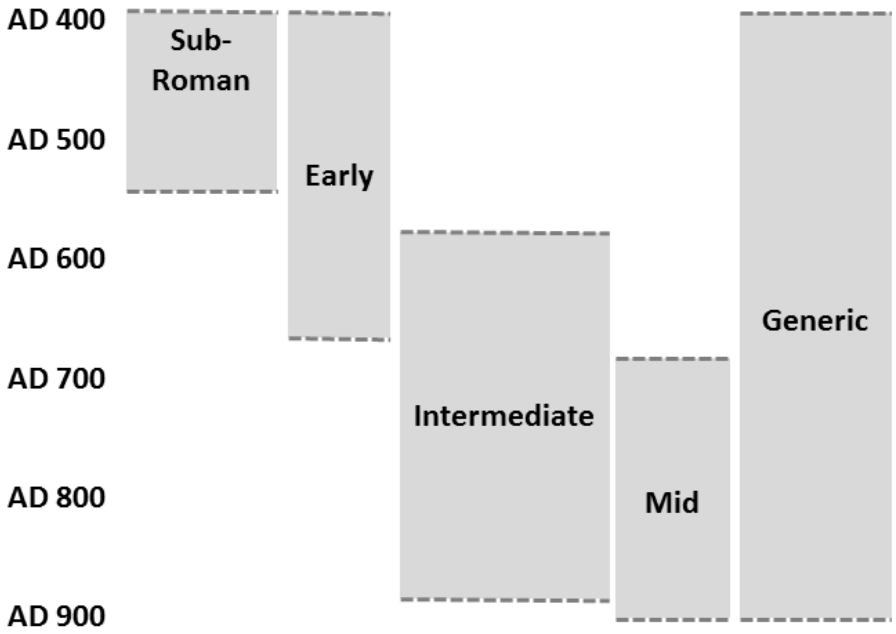


Figure 3.3 – Schematic representation of the chronological model applied to bioarchaelogical data.

Early Saxon assemblages are those deemed largely to pre-date *c.*AD 600, although they may include some early 7th century material. Besides radiocarbon determinations falling principally within the 5th-6th centuries, *Early* dates are chiefly characterized by (i) ceramic assemblages with relatively high proportions of decorated handmade sherds and/or relatively low proportions of organic-tempered sherds; (ii) rim sherds whose morphology is considered to be of 5th or 6th century date; (iii) annular loomweights; (iv) other chronologically diagnostic artefacts

such as ornamental metalwork; and (v) stratigraphic relationships with well-defined Late Roman and Intermediate/Mid Saxon phases.

Intermediate assemblages are those deemed largely to post-date *c.*AD 600, although they may conceivably include some late 6th century material and, in some cases, could theoretically be as late as the 9th century. Hence, they could potentially have considerable chronological overlap with *Mid Saxon* assemblages, which are deemed largely to post-date *c.*AD 720 but may include some material of later 7th century date and could, in some cases, extend into the later 9th century.

The Intermediate horizon (post-*c.*AD 600) is characterized chiefly by (i) relatively high proportions of organic-tempered sherds among handmade ceramics, with Ipswich Ware and decorated sherds very rare or absent, although Maxey-type ware may be present in some areas; (ii) the use of linear ditch systems within settlements; (iii) beamslot/post-in-trench construction; (iv) axial arrangement of buildings; (v) larger SFBs; (vi) coinage of 7th century date (*e.g.* Primary *sceattas*); and (vii) stratigraphic relationships with well-defined Early and/or Mid Saxon material. The Mid Saxon horizon (post-*c.*AD 720) can be characterized by any of the Intermediate qualifiers listed above, plus coinage of 8th-9th century date (*e.g.* Secondary *sceattas* and Mid Saxon pennies), and Ipswich Ware (especially in East Anglia, whereas in the Upper Thames valley a scarcity of pottery could be characteristic). The distinction between Early, Intermediate and Mid Saxon phases is most secure when they occur at a single site. Yarnton and Pennyland, for example, both have material belonging to all three phases.

The object of this chronological approach is to determine a likely *terminus post quem* for any given agricultural innovation that is apparent in the data, *i.e.* whether it only demonstrably occurs from the 8th century onwards, or whether it could already be apparent from the 7th century. Given the sometimes blurred distinctions between the sub-periods, such inferences should be considered probabilistic rather than definitive.

It was often impossible to obtain chronological precision beyond a span of four or more centuries, *e.g.* 5th-8th or 6th-9th centuries, usually because of a lack of diagnostic pottery types. Such material is here assigned to a *Generic* category. It should be understood that material of Generic date could derive from any sub-period between the 5th and 9th centuries, and does not necessarily span the entire 5th-9th century period. Although not useful for exploring chronological patterns, Generic material could nonetheless be useful in exploring geographical variability.

Where such material represents a post-Roman phase at an otherwise 'Roman' site, such as a villa or town, it has been treated as *Sub-Roman*. In most cases, the artefactual evidence from such Sub-Roman phases is no more closely datable than the Generic material, but stratigraphy usually suggests a *terminus post quem* in the early 5th century.

The assignment of data to these chronological categories is subjective, and it is readily acknowledged that the dates used in this project may well be disputed by other scholars, or require revision in the light of new discoveries. This is an inevitable caveat when studying a poorly dated period. The definition of the Intermediate category is especially contentious, and it should be stressed that the categories are not intended to be mutually exclusive: Intermediate material could well be contemporary with later-Early or Mid Saxon material, especially outside East Anglia where Ipswich Ware is lacking as an indicator of 8th-9th century dates. An extensive radiocarbon dating programme of known Early/Mid Saxon material would clearly be of enormous use to work such as this.

3.6 Inter-worker variability

Prior to the analysis of bioarchaeological data, the potentially biasing effects of inter-worker variability were considered. Differences in methodology, research design, scheduling, expertise and equipment could all have introduced biases into the dataset that may be mistaken for genuine zooarchaeological and archaeobotanical trends. While there is no comprehensive way in which such biases can be fully mitigated, a basic assessment of their potential impact can nonetheless be made through an investigation of worker representation, *i.e*. counting how many site reports each analyst has (co-)authored. While in theory a similar exercise could be used to assess variability amongst excavators of settlement evidence, in practice this would entail the consideration of an impractical array of variables, including project managers, lead authors and field units; the nature, circumstances and extent of excavation; the progress of post-excavation work; and the state of publication.

3.7 Zooarchaeology: data collection and analytical methods

Chapter 2 has already outlined some of the types of zooarchaeological data that may be available in specialist reports – taxonomic abundance, biometry, age-at-death, sex, pathology – besides which there may be information on butchery patterns, the representation of different skeletal elements, and stable isotope analysis. Not all of these topics can be studied here, and data types must therefore be prioritised. Taxonomic abundance data are basic to zooarchaeological studies, and should be available for most sites that have produced any identifiable faunal remains. These data will provide the essential framework for the investigation of animal husbandry in the study regions. Stable isotope analysis is potentially of interest, since it could reveal changes in foddering practices, but it is a relatively new field and few studies are yet available.[101] Butchery patterns and the representation of different skeletal elements reflect consumption rather than production practices, and therefore will not be considered in detail here (although it is recognized that they could be of importance in identifying some taphonomic biases).

Biometric data are frequently available in zooarchaeological reports and may relate directly to certain aspects of husbandry, such as (mal)nutrition and breeding. However, it is unclear as to how the significance of such data could be independently, objectively interpreted. It is uncertain, for example, what patterns of size-difference would be required before selective breeding could be inferred, rather than sexual dimorphism, or age- or health-related variability. Herd structures, as represented by ageing and sexing data, are more immediately (if equivocally) interpretable in terms of husbandry strategies, as demonstrated by Payne's frequently cited paper which presents

[101] Evans *et al.* 2007 pp.1994–2005.

idealized mortality profiles for flocks of sheep kept for meat, milk and wool respectively.[102] Biometric data have therefore been disregarded in favour of ageing and sexing data.

Sex profiles are problematic in that ratios can vary depending upon the skeletal element being used, and also because castrates can be difficult to distinguish.[103] Additionally, in practice, sexing data were available for very few faunal assemblages and were not easily standardized, and were therefore studied on a more qualitative basis. The same is true of pathological data which, although potentially useful for identifying penned sheep and plough beasts, for example, are problematic for similar reasons. There are no universally-applied standard criteria for the recording of skeletal pathologies in excavation reports, and their relationship with animal husbandry practices remains uncertain. The methods of Bartosiewicz, Van Neer and Lentacker for identifying and grading traction pathologies in cattle are only gradually being applied on a systematic basis, and very few Anglo-Saxon assemblages have yet been studied in this way.[104]

It should be noted that, in the zooarchaeological portions of this study, the term *assemblage* is used to refer specifically to a group of animal bones of common geographical, chronological and methodological origin, *i.e.* belonging to the same phase(s) at the same site, and recovered by comparable means.

Where possible and when deemed desirable (*e.g.* when read from graphs, rather than recorded directly), data were checked against those recorded by Sykes.[105]

3.7.1 Taxonomic abundance

Taxonomic abundance was recorded for cattle, ovicaprids and pigs. The bones of these animals generally dominate the faunal assemblages recovered from Anglo-Saxon settlements,

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[102] Payne 1973 pp.281–4, Fig.1–3.
[103] Coy in Haslam *et al.* 1980 p.46; Julie Hamilton pers. comm.
[104] Bartosiewicz *et al.* 1993; 1997; O'Connor 2000 pp.108–110; Richard Thomas pers. comm.
[105] Sykes 2007 pp.127–170.

alongside varying (but always relatively low) proportions of other mammals, birds, and fish. Some potentially problematic variables, such as inter-taxonomic differences in the number of identifiable bones, are held constant if the analysis is restricted to these three taxa.[106] Moreover, since cattle, ovicaprid and pig skeletons all contain relatively large and robust bones in comparison with, for example, domesticated fowl and goose skeletons, their relative abundance is less likely to be differentially affected by biases in preservation, recovery, and identification.

There has been extensive debate on the subject of how animal bones should be quantified and relative proportions calculated, with various competing and complementary methods having been proposed, of which 'NISP' and 'MNI' are the most commonly used.[107] The NISP (Number of Identified Specimens) method simply counts the number of bones or fragments assigned to each species. The method can vary according to how 'specimens' are defined: whether as identifiable bone fragments, whole bones (or equivalent diagnostic zones), or a restricted set of selected skeletal elements. By contrast, the MNI (Minimum Number of Individuals) method calculates, for each species, the minimum number of animals that would have been required to produce the faunal assemblage as recovered. Typically, this is equivalent to the commonest unique element in the assemblage. For example, an assemblage containing 12 left mandibles and ten right mandibles must represent at least 12 individuals (although it would receive an NISP count of 22).

Given that most animals raised and/or slaughtered at a site are unlikely to have left any identifiable trace in the archaeological record, neither of these methods can be used to estimate the numerical composition of a site's livestock in absolute terms.[108] Rather, the relative proportions calculated by MNI and NISP are used to obtain proxy values for the prevailing tendencies in a site's animal economy. The main drawback of NISP is that of potential

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[106] Lyman 2008 pp.28–30.
[107] O'Connor 2000 pp.54–67.
[108] Amorosi *et al.* 1996 p.138; *cf.* Tipper 2004 p.180, whose estimated flock-sizes are therefore of questionable validity.

interdependence (*i.e.* ten specimens could theoretically represent anything between one and ten animals), a problem which is exacerbated by differential skeletal representation or fragmentation within and between species.[109] It could be argued that the MNI method explicitly precludes the possibility of interdependence, but this is only true at a particular level of aggregation. The MNI represented in individual pits, for example, will generally be higher than that calculated for an entire site assemblage taken as a whole, because a single animal could theoretically be represented by different bones in several deposits at once.[110] This problem could even arise on a regional scale. For example, Crabtree has suggested that pig crania are unusually well-represented at Wicken Bonhunt because the meat-bearing carcasses were transported elsewhere: hence, the same pigs could be represented at two or more different sites.[111]

MNI does not, therefore, solve the problem of interdependence, and the methods of its derivation can differ more fundamentally than those of NISP, which is unaffected by aggregation. NISP values are therefore better suited to mathematical manipulation, which may be useful in comparing relative taxonomic abundances on a regional scale. NISP counts are also a prerequisite of MNI and are simpler to calculate, and hence were found to be more commonly available in excavation reports. NISP was therefore adopted as the main index of relative taxonomic abundance in this study. MNI data were also considered when encountered, not for direct use in inter-site comparisons, but as a check on the potential impact of differential fragmentation and skeletal representation on NISP results in individual assemblages.[112] For instance, the focus upon NISP data is likely to introduce a bias in favour of larger taxa which tend to produce more identifiable fragments: in this case, a bias towards cattle bones, against ovicaprids and pigs.[113]

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[109] O'Connor 2000 pp.54–7; Grayson 1984 pp.20–6.
[110] Lyman 2008 p.46; Grayson 1984 p.27.
[111] Crabtree 1996a pp.69–70.
[112] Hambleton 1999 pp.34–6; Julie Hamilton pers. comm.; Sykes 2007 p.28.
[113] O'Connor 2011 p.364.

The commonest method of visual analysis for NISP data is the tripolar graph, with the three axes representing the percentages of cattle, ovicaprid and pig bones respectively.[114] Since these graphs are not always intuitive to read, an annotated example is provided in Figure 3.4, based upon the sample data in Table 3.2. More easily-read alternative methods have also been utilized, including bar and pie charts displaying the relative proportions of the three taxa. These and all other graphs in this study were produced using OriginPro 8.5.1, unless otherwise stated.[115]

Table 3.2 – Sample NISP data.

Assemblages	NISP			% NISP		
	cattle	ovicaprid	pig	cattle %	ovicaprid %	pig %
A	350	1,011	407	19.8	57.2	23.0
B	7,310	5,403	1,180	52.6	38.9	8.5
C	2,108	704	1,288	51.4	17.2	31.4

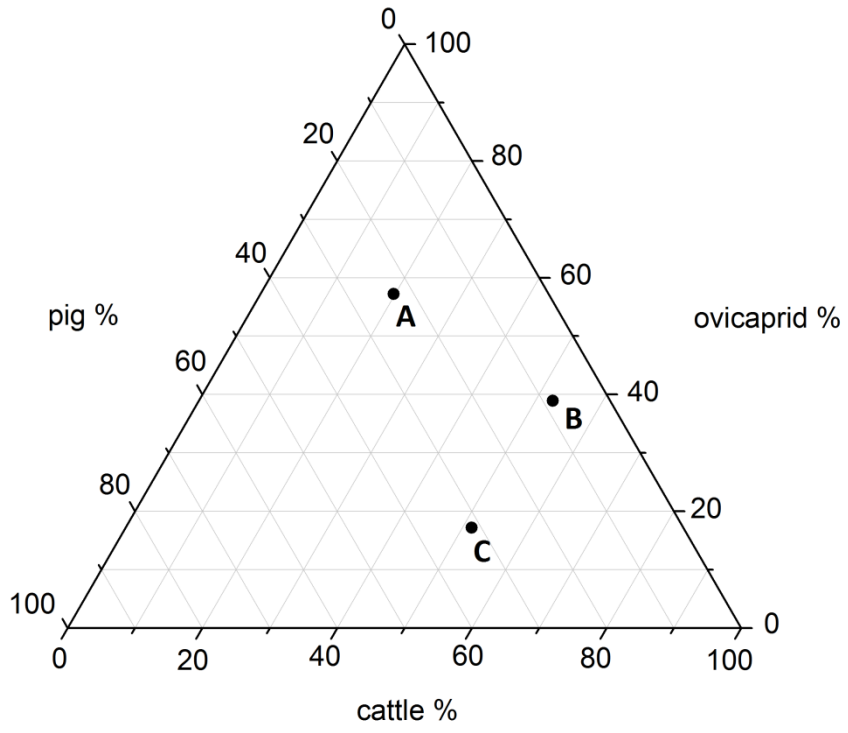


Figure 3.4 – Tripolar graph of sample NISP data in Table 3.2.

[114] *E.g.* Crabtree 2010 p.125, Fig.1.
[115] OriginLab Corporation 1991-2011.

As a general principle, it is anticipated that assemblages containing greater numbers of specimens are more likely to provide representative samples of the original populations as deposited in antiquity.[116] Some zooarchaeologists have therefore applied a NISP quorum, below which results are considered unreliable. The quorum must be set in such a way as to balance sufficient rigour with practical applicability. Hambleton, for instance, required there to be at least 300 identified specimens between the three taxa, whereas Sykes demanded only 100 specimens.[117] Following data collection and a review of the assemblage sizes represented in the study regions, it was decided that Hambleton's more rigorous quorum of 300 NISP retained enough assemblages to admit meaningful statistical analysis of chronological and geographical variation.[118]

Past studies have demonstrated that different zooarchaeological recovery methods can introduce different biases into the relative abundance of recorded cattle, ovicaprid and pig remains. Typically, the inclusion of material from sieved soil samples is thought to increase the quantitative importance of ovicaprids and pigs relative to cattle, whose larger bones may conversely be over-represented if hand-retrieval alone is practised.[119] The discrepancies can, however, be minimal; the addition of sieved material often extends the taxonomic range of an assemblage to include, for example, smaller-boned fish and birds, rather than drastically altering the relative proportions of cattle, ovicaprids, and pigs.[120]

During the course of data collection, sieved and hand-retrieved assemblages were recorded separately, where retrieval methods were specified in available reports. In practice, the sieved assemblages were found to be negligible. None was considered sufficiently abundant (≥300 NISP) for further analysis, and the amalgamation of sieved and hand-retrieved assemblages of common

[116] Amorosi *et al.* 1996 pp.132–4.
[117] Hambleton 1999 p.39; Sykes 2007 p.9.
[118] See below, §5.2.1.
[119] *E.g.* Payne 1972 pp.59–61.
[120] O'Connor 2000 p.31; Higbee in Lucy *et al.* 2009 p.289; Mulville & Ayres in Hey 2004 p.326.

origin had little impact upon the resultant NISP ratios (Figure 3.5). Sieved assemblages were therefore excluded from the analyses of relative taxonomic abundance.

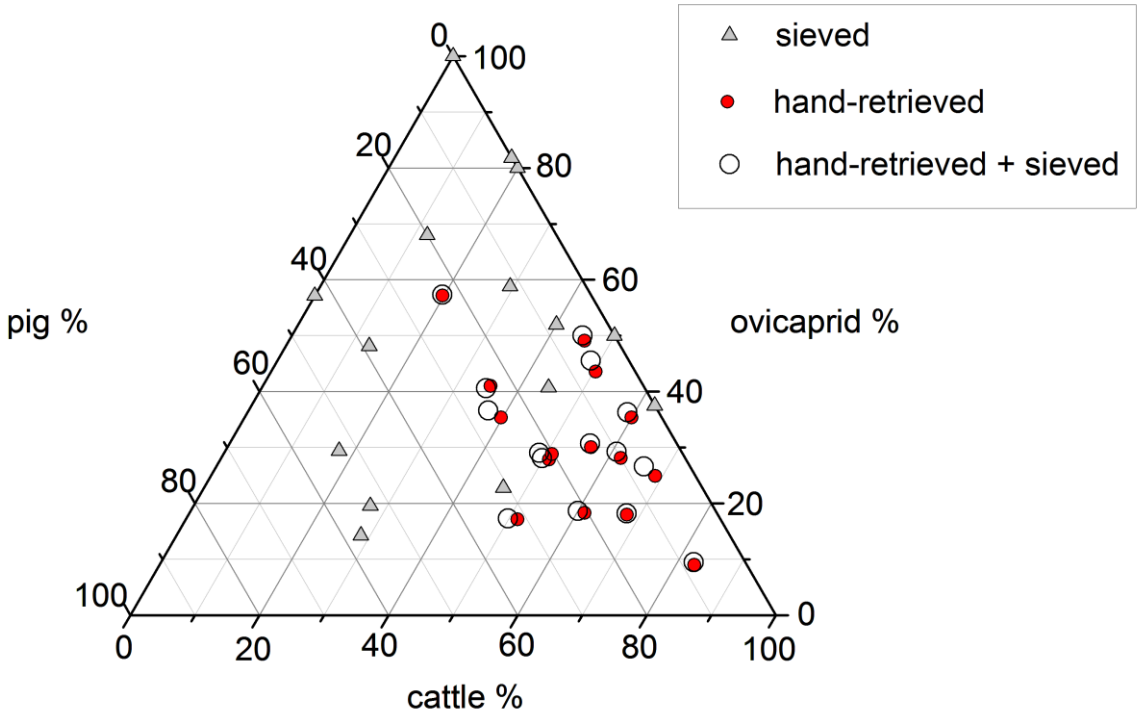


Figure 3.5 – Tripolar graph of NISP data, illustrating that the inclusion of sieved material does not greatly alter the NISP ratios derived from hand-retrieved material alone.

3.7.2 Ageing profiles

There are two common methods for estimating ages-at-death from faunal remains: epiphyseal fusion ageing, and dental/mandibular ageing. Epiphyses are terminal elements which fuse to their respective bones in a consistent sequence (though not necessarily at a consistent rate) for a given species. The ratio of fused to unfused epiphyses in an assemblage can therefore indicate the proportion of livestock that had been killed before reaching a particular stage in the sequence of fusion. Mandibular ageing is based upon the similarly consistent sequence in which

the three permanent molars and fourth premolar erupt in the mandible and are subsequently worn down from enamel onto dentine.[121]

There are various reasons for preferring mandibular over epiphyseal ageing in a comparative study such as this. Firstly, epiphyseal ageing relies on the presence of several different skeletal elements whereas the mandibular method requires only mandibles (and/or loose teeth). In addition, since mandibles and teeth are relatively robust elements whereas unfused epiphyses are relatively fragile, the epiphyseal method may be biased against younger animals. Even where epiphyses survive well in a faunal assemblage, the mandibular method retains the crucial advantage that it can produce a longer, more detailed mortality profile, since tooth-wear continues into old age whereas most epiphyses have fused by the time an animal is fully-grown, and therefore cannot reveal trends such as a high proportion of more mature animals indicative of secondary product specialization.[122] Mandibular data were therefore recorded as a means of investigating culling patterns.

The mandibular method does entail some problems and limitations, however, such as the possibility that processes of tooth-eruption and wear may be differentially affected by nutritional, genetic, environmental, or health factors. Hence, absolute ages suggested by comparison with modern reference profiles from unimproved specimens of known age can potentially be misleading.[123] Nonetheless, the eruption and attrition sequences of mandibular teeth can provide a guide to *relative* age, if not precise absolute ages in years.[124]

These relative ages were recorded in a standardized fashion, so that different assemblages could be compared. Hambleton and Sykes have each independently demonstrated how different

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[121] O'Connor 2000 pp.92–6; Chaplin 1971 pp.80–1.
[122] O'Connor 2000 pp.83–90; Payne 1973 p.283; Hambleton 1999 p.61; Maltby 1981 p.171.
[123] Silver 1969 pp.285–6.
[124] Reitz & Wing 2008 p.195.

methods of mandibular ageing can be converted into a standardized format.[125] This conversion is possible because all mandibular ageing methods essentially utilize the same relative sequence, and although there are different ways of recording and presenting this sequence (the most popular being those of Payne and Grant), the different classification systems can be correlated.[126] This study has adopted O'Connor's five basic mandibular 'landmark' stages of *Juvenile*, *Immature*, *Subadult*, *Adult* and *Elderly*, which are correlated with various published systems in Tables 3.3–3.5.[127] In very general terms, the *Subadult* life-stage is held to correspond roughly with the animal reaching full bodily maturity, *i.e.* the most 'efficient' time for it to be slaughtered for meat; whereas *Adult* and especially *Elderly* individuals will have been kept alive beyond reaching full bodily maturity, and will therefore have continued to provide secondary products. A targeted cull of *Juvenile* and *Immature* individuals may variously indicate the production of younger meat, a specialist dairying economy, and/or the slaughter of surplus stock that could not be overwintered.[128]

Although O'Connor's broad age-classes do entail some loss of information by summarizing data which are often presented in a more detailed series of stages, they do offer at least two advantages. Firstly, they make minimal uniformitarian suppositions regarding the precise relationship between the mandibular sequence and an animal's age. Secondly, fewer and broader groupings allow small samples to display patterns which might otherwise be 'spread too thinly' among a greater number of categories.[129]

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[125] Hambleton 1999 pp.64–7; Sykes 2007 p.10, Table 5.
[126] Grant 1982; Payne 1973.
[127] O'Connor 1989 pp.159–181.
[128] *E.g.* Crabtree 1989, pp.69-74.
[129] O'Connor 2003 p.161; *cf.* Hambleton 1999 p.63.

Table 3.3 – Mandibular ageing concordance for cattle (*MWS = Mandibular Wear Stage).

O'Connor 1988 p.85		Halstead 1985 p.219	Crabtree 1989 p.76	Sykes 2007 p.10	
				Estimated age	MWS* (Grant 1982)
Juvenile	1st permanent molar (M1) not in wear	A-B	1	0-6 months	1-7
Immature	M1 in wear, 2nd permanent molar (M2) not in wear	C	2	6-12 months	8-16
Subadult	M2 in wear, 3rd permanent molar (M3) not in wear	D	3	1-2 years	17-29
Adult	M3 in wear, but not heavily worn	E-H	4-5	2-8 years	30-47
Elderly	M3 heavily worn (at least wear stage j, *sensu* Grant)	I	6	8-10 years	48+

Table 3.4 – Mandibular ageing concordance for ovicaprids.

O'Connor 1988 p.85		Payne 1973 p.293	Crabtree 1989 p.76	Sykes 2007 p.10	
				Estimated age	MWS (Grant 1982)
Juvenile	M1 not in wear	A-B	1	0-6 months	1-6
Immature	M1 in wear, M2 not in wear	C	2	6-12 months	7-18
Subadult	M2 in wear, M3 not in wear	D	3	1-2 years	19-27
Adult	M3 in wear, but not heavily worn	E-H	4-5	2-8 years	28-47
Elderly	M3 heavily worn (at least wear stage j, *sensu* Grant)	I	6	8-10 years	48+

Table 3.5 – Mandibular ageing concordance for pigs.

O'Connor 1988 p.85		Bull & Payne 1982 pp.57–65	Sykes 2007 p.10	
			Estimated age	MWS (Grant 1982)
Juvenile	M1 not in wear	-	0-6 months	1-7
Immature	M1 in wear, M2 not in wear	7-11 months	6-12 months	8-16
Subadult	M2 in wear, M3 not in wear	19-23 months	1-2 years	17-26
Adult	M3 in wear, but not heavily worn	31+ months	2-3 years	27-40
Elderly	M3 heavily worn (at least wear stage j, *sensu* Grant)		3+ years	41+

Mandibular data can be expressed as 'mortality profiles', in which the percentages of mandibles in each assemblage are used as a proxy for the proportions of livestock culled at a particular stage of life. The results can be graphed most simply as bar charts, with a bar for each life-stage (Juvenile, Immature, Subadult, Adult, and Elderly). In using these data, a working assumption is made that all the mandibles in an assemblage can be taken to represent a single population.[130] In most instances, however, it is unlikely that an assemblage will represent a single biological population; rather, most will provide partial and time-averaged representations of several successive generations. This caveat must be borne in mind when the mortality results are interpreted.

As with NISP data, it is desirable to apply a quorum, excluding assemblages with too few mandibles to produce a representative mortality profile. The range of available sample-sizes was therefore assessed, and a minimum of 30 aged individuals (per species, per assemblage) was decided upon. Although this quorum is inevitably arbitrary, and excludes the majority of aged mandibles recorded in the study regions, smaller mandibular assemblages were deemed unlikely to be representative of genuine patterns.

[130] Sykes 2007 pp.9–10.

3.8 Archaeobotany: data collection

The archaeobotanical portion of this study focuses mainly upon plant macrofossils, such as seeds. Pollen sequences were not recorded as part of the core dataset. However, palynological studies encountered during the course of data collection are considered in Chapter 4.[131]

3.8.1 Terminology

The archaeobotanical dataset consists of records, samples and assemblages. The specific definitions of these terms, as used within this project, are outlined below.

An *assemblage* is a collection of samples belonging to a particular phase at a given site, and sharing a mode of preservation. Thus, for example, Yarnton has three charred assemblages (of Early, Intermediate, and Mid Saxon date respectively) and one waterlogged assemblage (of Mid Saxon date).

A *sample* is a collection of records deriving from a common archaeological context. Samples have been assigned codes, comprising letters (to denote the parent site) and sequential numbering, enclosed within chevrons, *e.g.* <FLX20>. These codes are specific to this project; the concordance tables in Appendix 2 list the sample and context numbers used in the original excavation reports, where available, allowing the reader to trace the original data for each sample. Where a single context has been sampled several times, and is clearly represented by multiple 'samples' in its original report, these samples have been amalgamated.[132] For example, sample <Y34-5> from Yarnton is an amalgamation of <Y34> and <Y35>, which both derive from

[131] See below, §4.6.
[132] Unless there are differences in botanical composition which may suggest that the context does not represent a single deposit.

context 3314, described as a 'layer'. In this way, as far as possible, the term *sample* has been reserved for plausibly discrete, independent deposits.[133]

Finally, for the purposes of this study, a *record* is defined by the following items of data, which are discussed in further detail below:

1. Taxonomic identification of a plant
2. Anatomical identification of the plant part (*e.g.* seed)
3. Quantity of items represented
4. Fragmentation, *i.e.* fragmented or whole
5. Precision/confidence of identification (*e.g.* '*cf*', 'type')
6. Mode of preservation (*e.g.* charred)
7. Sample and/or assemblage in which the record occurs

Some records were available only at assemblage-level. For Stonea Grange, for instance, the Anglo-Saxon material is amalgamated in the published report, so that archaeobotanical records are available for the assemblage but not for its individual constituent samples.

3.8.2 Attributes

Taxonomic identifications were initially recorded verbatim from original reports, including indeterminate items. Standardized nomenclature was then applied across the dataset. For most taxa, nomenclature follows Stace (2010) but, for some cereals, terminology was adapted from the older conventions common in archaeobotanical literature, including some 'traditional' names that have since been subject to taxonomic revision (Table 3.6).[134] For the most part, the conventional names are preferred in this study because of their widespread usage in current discourse, but the

[133] See further below, §3.8.4.
[134] Cappers & Neef 2012 pp.15–16.

genetic relationships encapsulated in the new scientific names are worthy of note, *e.g.* spelt and bread wheat belonging to the same biological species and therefore being interfertile.[135]

Table 3.6 – Traditional nomenclature of cereals, as used in the dataset, with common and new scientific synonyms.

traditional name	new scientific name	common name
Triticum spelta L.	*Triticum aestivum* ssp. *spelta*	Spelt wheat
Triticum dicoccum Schübl.	*Triticum turgidum* ssp. *diccocon*	Emmer wheat
Triticum aestivum L.	*Triticum aestivum* ssp. *aestivum*	Bread wheat
Triticum turgidum L.	*Triticum turgidum* ssp. *turgidum*	Rivet wheat
Secale cereale L.	*Secale cereale* ssp. *cereale*	Rye
Hordeum vulgare L.	*Hordeum vulgare* ssp. *vulgare*	Six-row barley
Hordeum distichum L.	*Hordeum vulgare* ssp. *distichon*	Two-row barley

'Cereals indet.' was used as a standard term for all indeterminate cereal records, including ambiguous cases such as *Secale/Triticum.* Likewise, 'Large legume indet.' was used to denote identifications such as *Vicia/Lathyrus*, *Vicia/Lathyrus/Pisum, Vicia/Pisum/Lens*, and similarly ambiguous records. The additional classification '*Triticum* L. free-threshing' was used to embrace the many terms – often synonymous and sometimes misleading – which archaeobotanists have used to describe free-threshing varieties of wheat. This generic term was deemed appropriate for *all* positive identifications of free-threshing wheats, since individual species such as bread and rivet wheat can be very difficult to distinguish in the archaeobotanical record unless rachis fragments are sufficiently well-preserved.[136] '*Triticum* L. free-threshing' serves as a neutral substitute for the widely-used generic term *Triticum aestivo-compactum*, which is not taxonomically legitimate.[137] The term 'glume wheat' is sometimes used in this project as a shorthand for emmer, spelt, and ambiguous identifications of emmer/spelt (no evidence of einkorn has been found). It has been preferred to the synonymous term 'hulled wheat', so as to avoid potential confusion with hulled barley, since the 'hull' denoted in each case is different.[138]

[135] Moffett 2011 p.350; Cappers & Neef 2012 pp.291–294.
[136] Moffett 1991 pp.233–235.
[137] M. Robinson pers. comm.
[138] See above, §2.3.

Standardized terminology was also applied to a selected suite of plant parts. *Seed* was used for all caryopses, achenes, nutlets and equivalent propagules for quantification purposes. The standard term *rachis* was applied to either nodes or internodes, whichever was greater in a given sample, so as to derive the MNI (as defined below). The standard term *glume base* includes not only individually recorded glume bases but also spikelet forks, commuted into two glume bases each for the purposes of comparative quantification. A working assumption was made that all indeterminate rachis was likely to represent free-threshing cereals, while indeterminate glume bases were more likely to represent glume wheats, in accordance with predicted preservation biases.[139] Rare instances of rachis ascribed to glume wheats, or glume bases ascribed to free-threshing cereals, were therefore deemed redundant, since the chaff of the respective cereals had already been quantified using the other standard parts described above. *Culm nodes* constitute another standard category, but only where ascribed to cereals (or large grasses which could represent cereals). Floret bases of oat and capsules of flax were also treated as standard parts because of their direct relevance to crop analyses.

All other recorded plant parts were either very rare, ill-defined, or else of uncertain quantitative value, and have therefore been deemed *non-standard parts* (*e.g.* 'chaff', 'flowering stems', and 'seed cases'). Unless otherwise stated, non-standard parts were excluded from quantitative analyses, so as to enhance the comparability of the data. Where relevant, however, the material was considered in semi-quantitative presence analyses.

The quantity of items ascribed to each taxon and plant part was recorded, except in those cases where the available reports stated presence only, or used a semi-quantitative scale of abundance (*e.g.* 'x' = 1-50, 'xx' = 50-100). In the latter cases, quantities were not recorded, since

[139] Boardman & Jones 1990 p.2.

these records are unsuitable for quantitative analyses but are nonetheless eligible for semi-quantitative presence analyses.

Fragmentation was recorded as a binary variable in each record, to distinguish between MNI and fragment counts. Archaeobotanical material is often fragmented to some extent, but the quantification of plant parts can be standardized by counting selected diagnostic zones (*e.g.* embryo ends of grains) rather than all individual fragments, and thus calculating minimum numbers of individuals (MNI) for each plant part.[140] Quantification procedures are not always specified in archaeobotanical reports, but it has been assumed that all counts refer to MNI unless fragment counts are explicitly specified. Fragment counts have been excluded from all quantitative analyses unless otherwise stated but, like non-standard parts, have been considered where appropriate in semi-quantitative presence analyses.

Some records are hedged or qualified, to indicate a lack of precision or confidence, *e.g.* '*Galium* cf. *aparine*' or '*Vicia faba* type'. These qualifications were recorded as separate variables within each record, to facilitate the identification of such tentative records in subsequent analyses.

Taxonomic identifications were divided into five categories: (A) likely cultivars, (B) possible cultivars, (C) wild taxa – potentially arable weeds, (D) non-arable taxa, and (E) indeterminate. The distinction between cultivated and wild/weedy taxa is to some extent arbitrary and should be considered provisional. Remains of indeterminate *Avena* L. and *Vicia* L., for example, might equally represent crops or wild taxa. Conversely, several taxa provisionally classified as possible arable weeds could well represent cultivated or at least deliberately gathered resources, such as fat hen (*Chenopodium album* L.). The ambiguities surrounding cultivation and deliberate gathering are considered on a taxon-by-taxon basis in Chapter 6. Class D, non-arable plants,

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[140] G. Jones 1990, 91-2.

consists mostly of woody perennials that are unlikely to set seed under arable conditions. Aquatic taxa (Ellenberg F11-12) were also assigned to class D, but damp-ground plants (F7-10) were categorized as possible arable weeds, to allow for the possibility of poorly-drained farmland in antiquity.[141]

3.8.3 Preservation

Modes of preservation – *e.g.* charring, waterlogging – were specified for each record in the dataset. This is a crucial variable, since the archaeobotanical representation of the various taxa and plant parts can be affected by differential preservation biases: charring, for example, is biased towards crops (and their associated weeds) whose processing sequences involve fire, especially cereals. Waterlogged deposits, by contrast, have potentially more diverse catchments.[142] Reliable comparisons between the occurrences of different taxa, and their different parts, therefore require that we compare like with like, *i.e.* that the dataset be divided into discrete subsets, each defined by a single mode of preservation.

To this end, each sample was assigned a principal means of preservation, which accounted for ≥70% of all whole plant parts in the sample. Assemblages were also assigned principal means of preservation on the basis of their constituent records and samples. The subsets of data were then analysed exclusively, *i.e.* analyses of the charred dataset consider only those samples and assemblages with charring as their principal means of preservation, and only the charred records within those samples/assemblages. Small quantities of differently preserved material (*e.g.* mineralized seeds in a predominantly charred sample) were omitted as potential contaminants. However, where no single means of preservation clearly predominated in a sample or assemblage, a dual means of preservation was recorded, *e.g.* 'charred/mineralized'. Such samples

[141] M. Jones 1988 pp.89–90. Ellenberg numbers and other ecological variables are discussed below, §3.9.5.
[142] Dennell 1976a p.231; Green 1982 pp.42–3.

provided a valuable opportunity to compare the co-occurring modes of preservation and thus explore the impact of taphonomic biases related to preservation.[143]

For a small number of records, the mode of preservation left some doubt as to the antiquity of the material, *e.g.* 'uncharred,' 'part-charred,' or 'part-mineralized'. Such material – always rare and of low quantity – has been omitted, since it may well represent modern contamination.

A separate classification, 'ceramic assemblages,' was applied to all plant remains preserved as impressions in fired clay. This material cannot constitute 'samples' or 'assemblages' in a sense comparable to the charred, waterlogged or mineralized material. The formation processes of ceramic plant impressions are fundamentally different from those of plant remains derived directly from soil samples: the preservation and identification of these impressions may owe as much to pottery taphonomy as to ancient plant-use.[144]

3.8.4 Independence

As G. Jones has argued, archaeobotanical data are most usefully analysed at a level which can be related to individual behavioural or depositional activities.[145] Hence, it is important to determine whether samples are *independent* (each representing a different activity), *interdependent* (several representing a single activity), or *composite* (each representing several activities). These distinctions are important because the associations between different taxa can only be usefully investigated in *independent* samples.[146] Composite samples, by contrast, may exhibit spurious co-occurrences of taxa that were not in fact grown, processed or deposited together, but whose co-occurrence is entirely due to redeposition or post-depositional factors. As

[143] Strictly speaking, the principal means of preservation of sample <SMB2> is waterlogging (71.8%); but since the sample also contains a substantial number of charred items (239 = 28.2%) it was, exceptionally, given a dual means of preservation (waterlogged/charred).
[144] Dennell 1972; 1976b p.13.
[145] G. Jones 1991 p.64.
[146] Bogaard 2004 pp.61–62.

mentioned above (§3.8.1), interdependent samples were amalgamated to produce independent samples, if their interdependence was implied by the available stratigraphic information and/or similarities in botanical composition. For the avoidance of doubt, samples whose interdependence was suspected, but not demonstrable, were excluded from sample-based analyses. Data from composite and interdependent samples were nonetheless eligible for inclusion in assemblage-based analyses.

3.8.5 Context types

For each sample, a description of its parent context was recorded. Contextual data can assist in the interpretation of samples' depositional histories and botanical contents.[147] Feature-types were recorded where specified in original reports, and then grouped into broad categories to facilitate analysis. These standardized categories, although admittedly arbitrary and somewhat subjective in nature, at least provide a broad indication of the contexts from which the samples derive.

1. *ditch/gully* – incorporating ditch, gully, channel, and comparable terms;
2. *hearth/oven* – including those situated within SFBs or other structures;
3. *pit* – including those situated within SFBs or other structures;
4. *well/sump/watering hole* – not always strictly distinguishable from pits;
5. *posthole*;
6. *sunken-featured building (SFB)* – the fills and bases of these structures;
7. *other* – all remaining feature types, some rare ('dark earth,' 'layer,' 'furnace rake-out,' 'midden'), some vague ('pit/ditch', 'building', 'feature'), and some entirely unspecified or unclear.

[147] Hillman 1981 pp.124–5.

3.9 Archaeobotany: analytical methods

3.9.1 Derived attributes

For each sample, besides the attributes detailed above, two further attributes were derived: abundance and average density.

Abundance here denotes the total quantity (or MNI equivalent) of standard plant parts of a given mode of preservation, in a given sample. So defined, abundance serves two main purposes. Firstly, it allows for the identification of *numerically insufficient* samples, *i.e.* those whose plant parts are too few to justify quantitative analysis, and whose composition may be unrepresentative and misleading.[148] Various thresholds for numerical sufficiency were explored. Although arbitrary, a quorum of 30 was eventually found to be both realistic and reasonably rigorous in most analyses: excluding samples so meagre that percentages held little meaning, without reducing the dataset so far as to prohibit inter-site comparisons. A reduced quorum of ten items was used in correspondence analysis.[149]

Abundance was used in tandem with volume data to calculate *average density*. Average density is here defined as the quantity of standard plant parts per litre of sediment, for a given sample. Where possible, the sediment volume of each sample was recorded in litres. In some reports, no sample volumes were specified, or else a different unit of measure was employed (often kilograms), such that average density could not be calculated. Average density can serve as a proxy for deposition rates, on the grounds that rapid deposition should result in a relatively dense concentration of plant remains (provided that there has been little later disturbance), whereas gradual, piecemeal deposition should result in a sparser distribution of plant remains in the sampled soil. Thus, average density can potentially shed light on a deposit's taphonomic

[148] G. Jones 1991 p.67.
[149] See below, §3.9.6.

history and so perhaps, by extension, elucidate its functional significance within the plant economy.[150]

3.9.2 Semi-quantitative 'presence analyses'

The dataset was then assessed in terms of taxonomic composition. At the most general level of analysis, this entailed the compilation of inventories, listing the identified taxa and their presence or absence for each region and period. In order to facilitate analysis, some overlapping taxonomic identifications were amalgamated. Such amalgamation required at least one of the following conditions to be met:

(i) The seeds of the amalgamated taxa were deemed to be virtually indistinguishable on the basis of gross morphology, *e.g. Bromus hordeaceus* and *B. secalinus*; judgements were made with reference to modern seed reference collections.

(ii) The taxonomic identifications were, potentially, entirely overlapping within the project dataset for a given mode of preservation. For example, charred records of *Malva* sp. and *Malva sylvestris* could be amalgamated, since no other species in the genus *Malva* occurred within the charred dataset. Similarly, subspecies and varieties were amalgamated to species-level: *e.g. Vicia faba* var. *minor* was amalgamated with *Vicia faba.*

In this way, ecologically comparable taxa were not counted repeatedly, but species-specific information was retained where appropriate.

Inventories based upon these taxonomic groupings provided a means of rapidly assessing the range of taxa within the dataset. Semi-quantitative 'presence analyses' were then undertaken by calculating the proportions of assemblages or samples within which each taxon occurred. Such 'presence' values (also known as *constancy* or *ubiquity*) offer a broad perspective on vegetation

[150] van der Veen 2007 p.987, Table 6.

history, useful for characterizing general patterns in the relative frequencies of taxa.[151] Presence analyses were conducted at both assemblage- and sample-level.

The results of these presence analyses offer an overview of the general 'shape' of the dataset and its taxonomic composition. This semi-quantitative level of description does, however, have limitations. Primarily, because it is a binary system (a taxon is either present or absent), it cannot differentiate between major, minor, and negligible occurrences within individual samples or assemblages.[152] A taxon could be ubiquitous without ever being abundant, or abundant in only a small number of samples. Presence analysis will therefore tend to exaggerate small differences in the archaeobotanical record. Moreover, strictly speaking, presence analysis should be applied only to samples or assemblages with similar quantities of plant remains, since the likelihood of any taxon occurring becomes greater as the overall abundance of plant remains increases.[153]

3.9.3 Quantitative analyses

Quantitative analyses aim to investigate (i) patterns in the relative abundance of different crop taxa, (ii) patterns in the relative abundance of different weed taxa, and the ecological implications of these patterns, and (iii) the relationships between crops, weeds and other taxa. Relative taxonomic abundance was most straightforwardly studied as a series of percentages, standardized by plant part as appropriate, tailored to address different research questions. For example, the relative proportions of barley and free-threshing wheat (in terms of the percentages of identified free-threshing cereal grains) were calculated on a sample-by-sample basis. However, prior to the calculation of these percentages, it was necessary to take account of certain potential biases.

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[151] Hubbard 1980 pp.52–3.
[152] G. Jones 1991 pp.64–5.
[153] Hubbard 1980 p.52.

Hubbard rejected fully-quantitative descriptions of botanical data in favour of semi-quantitative approaches, on the grounds that the numerical composition of an archaeobotanical deposit is unlikely to be an accurate reflection of its 'parent economy,' given the wide range of taphonomic biases to which it has been subject, in terms of deposition, preservation and recovery.[154] In some cases, where the impact of these potential biases is impossible to determine, presence analysis may indeed be the most legitimate use of the data. However, measures can often be taken to identify and account for some biases. As noted above, certain preservation biases – such as the differential effects of charring on different taxa and plant parts – are predictable and, to some extent, can be accounted for simply by standardizing the units of analysis and by isolating different modes of preservation.[155]

Another potentially biasing factor, crop processing, has been found to influence not only the crop content of samples, but also the weed floras preserved alongside the crops. In short, the crop processing sequence introduces systematic biases into the botanical composition of samples that might otherwise be mistaken for ecological or economic trends.[156] However, these biases are predictable and the problem can be addressed statistically. Since different crop types are processed in different ways, samples were first grouped according to dominant crop types, *i.e.* crops which could in theory have been grown and processed together. Free-threshing cereals, glume wheats, pulses, and flax all constitute 'crop types' in the sense that they each have a distinct processing sequence. A crop type was considered dominant if its standard parts constituted ≥80% of all positively-identified standard crop items in the sample, provided that the standard crop items numbered at least 30. Indeterminate wheats, cereals, and large legumes were not included in these calculations except for where, as mentioned above, indeterminate rachis was taken to represent free-threshing cereals, and indeterminate glume bases were taken

[154] Hubbard 1980 p.51.
[155] G. Jones 1991 pp.64, 69. See above, §§3.8.2–3.8.4.
[156] Bogaard *et al.* 2005 p.508.

to represent glume wheats.[157] Indeterminate oat grains (*Avena* L.) were provisionally treated as free-threshing cereals for the purposes of these calculations; the question of whether they represent cultivars or arable weeds is considered again in Chapter 6.[158]

3.9.4 Investigating crop processing

The processing of harvested crops introduces a taphonomic bias into the botanical composition of samples. Since different crop taxa may be treated differently depending upon their intended use (*e.g.* fodder may not be so thoroughly sieved as foodstuffs), and since different weed taxa may behave differently depending upon the physical character of their seeds, it is important to determine what sort of behavioural activity – *i.e.* what crop processing stage – is represented by a given archaeobotanical sample. A sample's constituent crop components and weed seeds may all be affected, not only by the various processing stages themselves (*e.g.* winnowing), but also by the possible admixture of different products and by-products, which would produce problematic composite samples with potentially spurious co-occurrences of taxa.

The archaeobotanical study of crop processing has been developed extensively by Glynis Jones, based upon her ethnographic studies of traditional farming communities on the Aegean island of Amorgos. Her approach is based upon the general observation that the basic processing sequence for cereal crops admits little variation, such that modern traditional practices can provide a useful analogue for past activity. The various stages of threshing, winnowing, and sieving are likely to be common to cereal farmers widely separated in time and space.[159]

As Hillman has argued, among the various products and by-products of the cereal processing sequence, five should in theory be particularly prone to archaeological preservation by

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[157] Above, §3.8.2. Experimental inclusion of these indeterminate taxa, directly or via proportional reassignment, complicated rather than clarified the results, and did not lead to the utilization of many more samples.

[158] See below, §§6.3.1, 6.6.2.

[159] Hillman 1981 pp.126–38; G. Jones 1984 p.46.

charring: the waste by-products of (i) winnowing, (ii) coarse-sieving and (iii) fine-sieving, which may be burnt as fuel; and the stored grain products – whether (iv) semi-clean/unsieved, or (v) fully clean/sieved – which may be charred accidentally during storage or culinary preparation (Table 3.7).[160]

For free-threshing cereal crops, winnowing and coarse-sieving by-products should generally be relatively rich in rachis segments; fine-sieving by-products should be dominated by arable weed seeds, except for those which mimic crops and are thus retained by the sieves; and products (iv) and (v) should both be dominated, to a greater or lesser extent, by 'clean' cereal grain.

[160] Hillman 1984 p.11.

Table 3.7 – Highly simplified model of the cereal processing sequence, showing predicted products and by-products likely to be preserved by charring (after G. Jones 1984, p.44, Fig.1; p.55, Fig.6).

WEED SEED BY-PRODUCTS		PROCESSES & PRODUCTS		CHAFF BY-PRODUCTS
		Harvest		
		↓		
small, free, light	←	Threshing & Winnowing	→	light chaff
		↓		
small, headed, light small, headed, heavy big, headed, heavy	←	Coarse-sieving	→	heavier chaff
		↓		
		'Semi-clean' unsieved grain + small/big, free, heavy weed seeds		
		↓		
		(for glume wheats only) Dehusking, more winnowing and sieving	→	glume bases
		↓		
small, free, heavy	←	Fine-sieving		
		↓		
		Cleaned grain product + big, free, heavy weed seeds		

These general observations have been adapted by Jones into a quantified model, here termed 'ratio analysis', in which the relative proportions of cereal grains, rachis (inter)nodes, and weed seeds are calculated for each sample dominated by free-threshing cereals, provided that each sample contains at least 30 of these items in total. The resultant ratios are then compared with those calculated for Jones' ethnographic control samples of known origin, representing winnowing by-products, coarse-sieving by-products, fine-sieving by-products, and fine-sieving products, although Jones found that winnowing and coarse-sieving by-products are not easily

distinguishable on this basis (Table 3.8).[161] The results can also be assessed visually by plotting the samples on tripolar graphs (Figures 3.6–3.7).

Table 3.8 – Characterization of crop processing (by)-products according to grain, chaff and weed seed content (from ethnographic control data of G. Jones 1990, 93-6).

	grain	rachis	weed seed
FSP (fine-sieve products)	≥80%	≤5%	
FSBP (fine-sieve by-products)		≤5%	≥50%
USG (unsieved grain, *i.e.* FSP + FSBP prior to fine-sieving)		≤5%	20-50%
MS (mixed stages)		6-30%	
CWBP (coarse-sieve or winnowing by-products)		>30%	

NB. The composite categories USG and MS are interpolated from Jones' classifications.

As Jones notes, however, a close match between ethnographic and archaeological data cannot necessarily be expected. For example, rachis segments may be under-represented in charred samples because of their relative fragility, a bias demonstrated through experimental charring. Other variables, such as the thoroughness of winnowing and sieving, and the amount of weed material originally harvested with the crop, always remain unknown.[162] Moreover, the method of 'ratio analysis' described above is not directly applicable to samples dominated by glume wheats, or those with a substantial proportion of glume wheats alongside free-threshing cereal remains, since these crops are processed in a different way: an additional stage, 'dehusking', is required after initial winnowing and sieving in order to remove the grains from their encasing glumes, which must then be removed by further winnowing, sieving, and/or hand-sorting. Glume bases and rachis segments are also subject to different preservation biases. Hence, the ethnographically determined ratios of grain, rachis and weed seeds which are found by Jones to characterize different products and by-products may be compared with only those archaeological samples which are dominated by free-threshing cereals.

[161] The method and ethnographic data are published in G. Jones 1990.
[162] G. Jones 1990 pp.92–3; Boardman & Jones 1990 pp.2, 9–10.

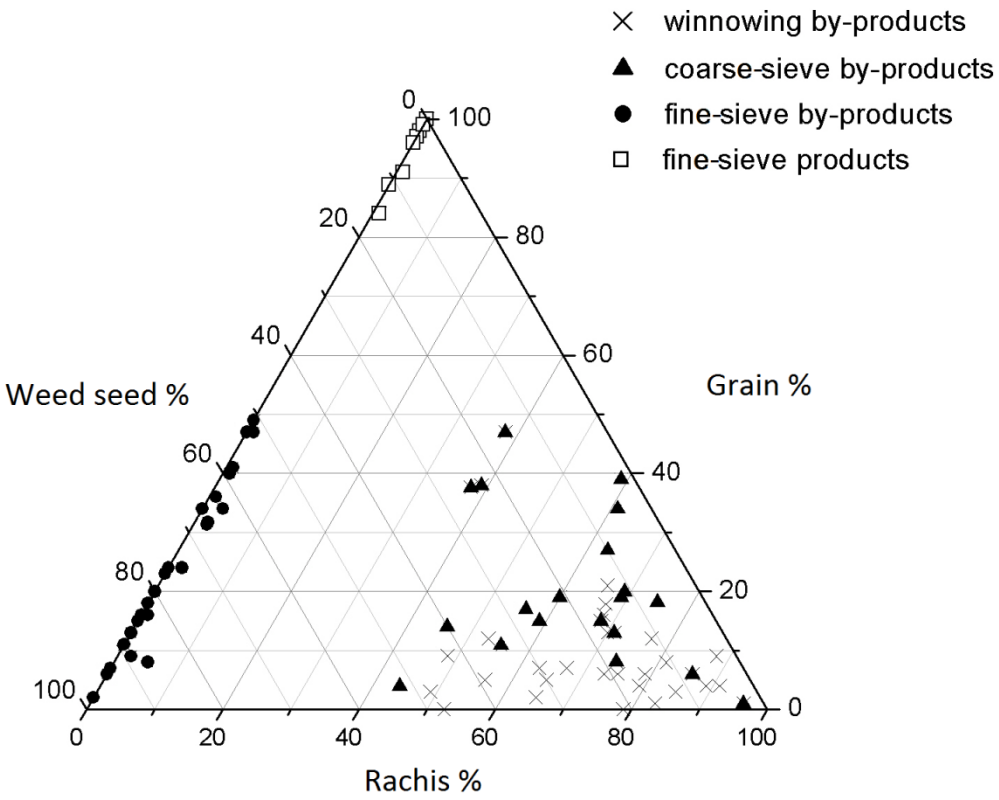


Figure 3.6 – Tripolar graph of 'ratio analysis' ethnographic data – after G. Jones 1990, 93-6.

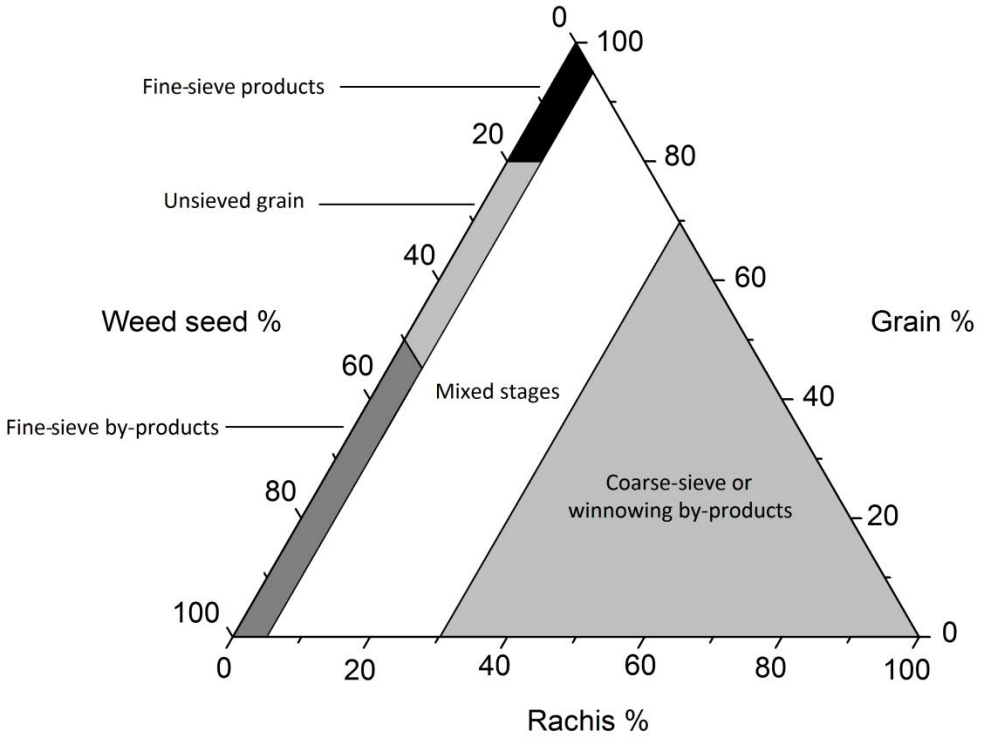


Figure 3.7 – Idealized interpretation of ratio analysis tripolar graphs (based on Table 3.8).

Given these caveats, it was deemed prudent to use ratio analysis alongside an independent, complementary method of crop processing analysis, again devised by Jones through ethnographic studies on Amorgos: discriminant analysis of weed seed types, a method which is equally applicable to all samples regardless of their dominant cereal types. At each processing stage, the removal or retention of weed seeds among harvested grain depends upon their physical and aerodynamic properties, defined by Jones in terms of size, weight and headedness (see 'weed seed by-product' column of Table 3.7). Weed seeds in the dataset were assigned to six different categories according to these properties, drawing upon the results of previous studies as well as the author's own observations (Table 3.9).[163]

These weed seed types were used as variables to distinguish between different products and by-products. By using the multivariate technique of discriminant analysis to derive two new variables (discriminant functions) that most strongly differentiate between the products and by-products of known origin from Amorgos, it was possible to classify the archaeological samples alongside the modern control samples on the basis of their weed seed contents.[164] Discriminant analysis was conducted using IBM SPSS Statistics for Windows 19, utilizing all samples in which at least ten weed seeds could be assigned to one of Jones' six types, and applying the 'leave-one-out' option for greater rigour.[165] The reclassification of control samples achieved a high degree of accuracy (84%). The software provided classifications and probability scores for the archaeological samples in tabular form; the results were also assessed visually as a scattergraph using the discriminant functions (Figure 3.8).

[163] G. Jones 1987 p.313, Table 1; van der Veen 1992 p.207, Table 7.4; A. Bogaard & M. Charles pers. comm.
[164] G. Jones 1984 pp.54–9. Ethnographic data used by kind permission of G. Jones.
[165] IBM Corporation 1989, 2010.

Table 3.9 – Weed species categorized according to physical properties of seeds.

big, free, heavy
Agrostemma githago L.
Avena L. indet. (where included)
Bromus hordeaceus L./*secalinus* L.
Convolvulus arvensis L.
Fabaceae (large-seeded)
Fallopia convolvulus (L.) Á. Löve
Fumaria officinalis L.
Galeopsis tetrahit L.
Galium aparine L.
Galium palustre L.
Lathyrus aphaca L.
Lathyrus L.
Lolium temulentum L.
Poaceae
Ranunculus arvensis L./*parviflorus* L.
Ranunculus subg. *ranunculus* L.
Torilis arvensis Huds. Link/*japonica* (Houtt.) DC.
Vicia L./*Lathyrus* L. (large-seeded)
Vicia L.
Vicia sativa L.
Vicia tetrasperma (L.) Schreb.
big, headed, heavy
Anthemis arvensis L.
Anthemis cotula L.
Cladium mariscus (L.) Pohl
Raphanus raphanistrum L.
small, free, heavy
Agrostis L.
Amaranthaceae
Aphanes arvensis L./*australis* Rydb.
Atriplex L.
Atriplex patula L./*prostrata* Boucher ex. DC.
Bolboschoenus maritimus (L.) Palla
Brassica L.
Brassica nigra (L.) W.D.J. Koch
Brassica rapa ssp *campestris* (L.) A.R. Clapham
Carex distans L./*sylvatica* Huds./*laevigata* Sm.
Carex flava L.
Carex L.
Carex panicea L.
Chenopodium album L.
Chenopodium ficifolium Sm.

Chenopodium hybridum L.
Chenopodium L.
Chenopodium murale L.
Chenopodium polyspermum L.
Chenopodium rubrum L./*glaucum* L.
Danthonia decumbens (L.) DC.
Eleocharis palustris (L.) Roem. & Schult./*uniglumis* (Link) Schult.
Fabaceae (small-seeded)
Galium L.
Hyoscyamus niger L.
Lolium perenne L.
Montia fontana ssp *chondrosperma* (Fenzl) Walters
Montia fontana ssp *fontana* L.
Persicaria Mill.
Persicaria lapathifolia (L.) Delarbre
Persicaria maculosa Gray
Persicaria minor (Huds.) Opiz
Phleum L.
Phleum pratense L.
Plantago major L.
Poa annua L.
Poa L.
Poa pratensis L.
Poa trivialis L.
Poaceae (small-seeded)
Polygonum aviculare L.
Polygonum L.
Prunella vulgaris L.
Ranunculus flammula L.
Rumex acetosa L.
Rumex acetosella L.
Rumex conglomeratus Murray/*obtusifolius* L./*sanguineus* L.
Rumex crispus L.
Rumex longifolius DC.
Rumex L.
Scirpus L.
Sherardia arvensis L.
Sinapis L.
Sinapis alba L./*arvensis* L.
Spergula arvensis L.
Stellaria media (L.) Vill.
Trifolium arvense L./*campestre* Shreb./*dubium* Sibth./*repens* L.
Trifolium L.
Trifolium pratense L./*repens* L.

Urtica urens L.
Valerianella dentata (L.) Pollich
Veronica arvensis L.
Vicia L./*Lathyrus* L. *etc*. (small-seeded)
small, free, light
Anisantha sterilis (L.) Nevski
Euphrasia L./*Odontites vernus* (Bellardi) Dumort.
Juncus L.
Sonchus asper (L.) Hill
Tripleurospermum maritimum (L.) W.D.J. Koch/*inodorum* (L.) Sch. Bip.
small, headed, heavy
Arenaria serpyllifolia L.
Glebionis segetum (L.) Fourr.
Malva sylvestris L.
Malvaceae
Medicago lupulina L.
Plantago lanceolata L.
Silene flos-cuculi (L.) Clairv.
Silene gallica L.
Silene L.
Silene latifolia Poir.
Silene vulgaris (Moench) Garcke
small, headed, light
Hordeum murinum L.
Papaver rhoeas L./*dubium* L.

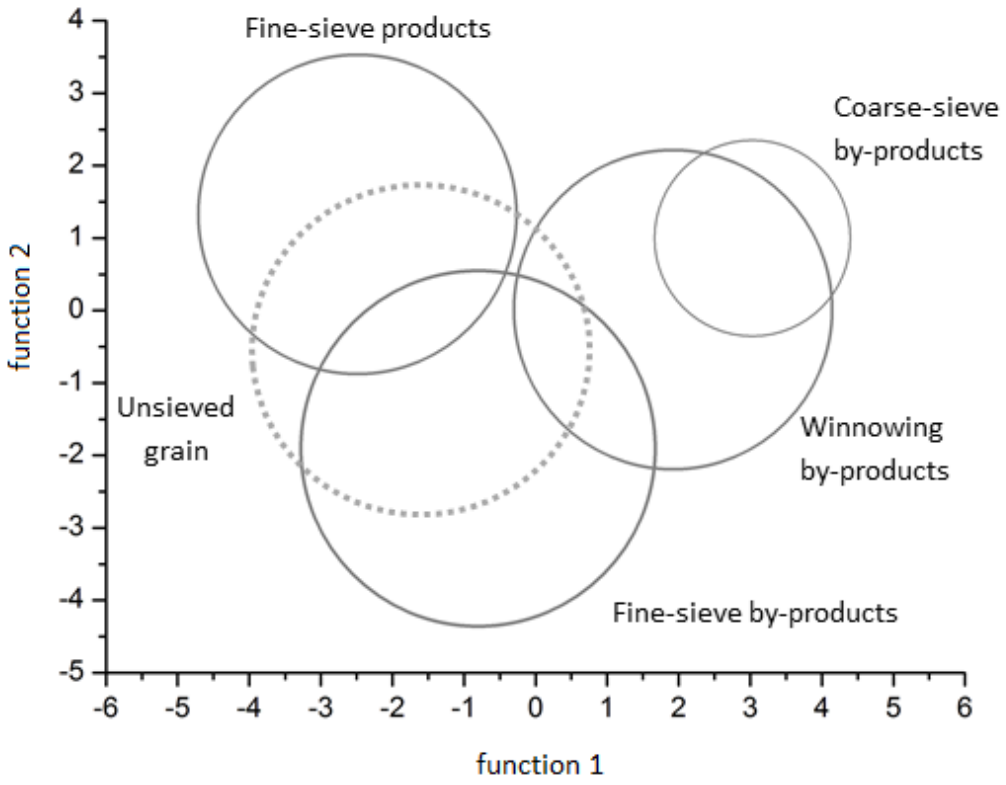


Figure 3.8 – Model scatterplot for the visual interpretation of discriminant analysis results.

Each circle encloses *c*.90% of the ethnographic control samples representing each product or by-product – based upon G. Jones 1987 p.315, Fig. 1 and pers. comm.

The most reliable inferences may arguably be drawn from the *combined* application of both the ratio and discriminant analysis methods. Accordingly, both analyses were performed for the samples dominated by free-threshing cereals. Where the results of the two analyses were compatible for a given sample, that sample was assigned to a crop processing stage accordingly; the criteria for compatibility are summarized in Table 3.10. The ratio classification 'USG' was deemed to be compatible with discriminant classifications 'FSP' and 'FSBP' if the sample fell approximately between the centroids of these zones in the discriminant analysis graph (see dotted grey circle in Figure 3.8).

Table 3.10 – Theoretical compatibility of ratio and discriminant analysis classifications; mutually compatible cases are highlighted.

		Ratio analysis				
		CWBP	FSBP	USG	FSP	MS
Discriminant analysis	CWBP	**X**				
	FSBP		**X**	**X**		
	FSP			**X**	**X**	

Discriminant analysis was also undertaken for samples dominated by glume wheats. While the ratio method described above could not be applied directly to these samples, their general botanical composition (*e.g.* ratios of grain to glume bases) was taken into consideration.

Indeterminate *Avena* caryopses were treated as cereal grains rather than as weed seeds for the purposes of crop processing analyses, unless it was found that greater compatibility of results could be achieved by treating them as weed seeds. Such judgements were made on a sample-by-sample basis. In most instances, however, the treatment of *Avena* had little overall impact on the classification of samples, since oat caryopses were seldom present in large quantities.

3.9.5 Weed ecological data

Weed ecology was studied in order to make inferences about growing environments and, by extension, crop husbandry practices. There are various possible approaches to the study of weed ecology. In this project, an autecological approach was adopted, in which the ecological tolerances/preferences of individual taxa, as determined through modern field observations, were recorded. Autecology was considered preferable to a phytosociological approach based upon recognized plant communities, since the latter would not necessarily allow for substantial changes in weed spectra since antiquity.[166]

Ecological data pertaining to the wild taxa in the dataset were collected from two main botanical compendia:

[166] Charles *et al.* 1997 pp.1151–2; Bogaard 2004 pp.5–7.

- *PLANTATT* (Hill *et al.* 2004; http://www.brc.ac.uk/resources.htm – accessed May 2013)
- *Ecoflora* (Fitter & Peat 1994; http://www.ecoflora.co.uk – accessed May 2013)

Data from these sources were checked and supplemented through the consultation of selected literature.[167]

The principal ecological variables collected were life history (perennation); woodiness; flowering time (onset and duration in months); maximum flowering height (in centimetres); and Ellenberg indicator values, adapted for British flora, for availability of light (L), soil dampness (F), acidity (R), fertility (N), and salinity (S). The Ellenberg indicator values operate on a numerical scale describing a species' ecological preferences, as perceived in modern field observations.

It must be acknowledged that the use of these autecological data entails some caveats. Principally, because the data are based upon field observations of the species' respective occurrences in different environments, they are largely descriptive rather than explanatory, and do not differentiate between 'the many environmental variables to which individual species are responding'.[168] Hence, they do not permit a detailed analysis of growing conditions. Functional autecology (*e.g.* the 'FIBS' approach) addresses this deficiency, and is therefore methodologically more rigorous and informative. Original applications of this approach require the accumulation of primary data, which is beyond the scope of this project. The functional attribute of flowering onset and duration, however, was used as an index of sowing times. This approach follows the findings of Bogaard, Jones, Charles and Hodgson, who conducted a functional ecological analysis of flora of known origin from modern German field surveys, and found flowering onset and duration to be the most successful discriminating variables for distinguishing seasonality in

[167] Stace 2010; Streeter 2010; Grime *et al.* 1988; Ellenberg 1988; <http://www.botanicalkeys.co.uk>, accessed May 2013.
[168] Charles *et al.* 1997 p.1152.

sowing.[169] The basic principle is that species which are able to flower and set seed after the disturbance of springtime ploughing – *i.e.* annuals whose flowering time is late or long, and perennials which can regenerate from vegetative fragments – are at a competitive advantage among spring-sown crops, whereas early- and short-flowering species may thrive undisturbed among autumn-sown crops, unless they are weeded out by hand (Table 3.11).[170] These flowering variables were used in a discriminant analysis, comparing samples from the project dataset with the German control data used in the original study, in order to investigate sowing times.[171]

Table 3.11 – Relationships between the flowering onset and duration of annual arable weeds and sowing times of crops, after Bogaard *et al.* 2001 p.1175, Table 3.

	flowering onset/duration	offers competitive advantage in
early/short	Jan.-Jun., 1-3 months	autumn-sown fields
late	Jul.-Dec., 1-5 months	spring-sown fields
long	Jan.-Jun. >5 months	spring-sown fields
intermediate	Apr.-Jun., 4-5 months	autumn- and spring-sown fields

3.9.6 Weed ecological analyses

The literature review has highlighted certain arable weed species which, according to recent studies, may be indicative of agricultural innovations in the Mid Saxon period, such as stinking chamomile as an indicator of resumed cultivation of heavy clay soils, and henbane as an indicator of middening. The occurrence and significance of these perceived 'indicator species' can be investigated using the semi-quantitative approaches outlined above for the study of crop species. It is preferable, however, to take account of a wider range of species than those few which have been predefined as 'indicators'. Inferences based upon a wider range of taxa are less likely to be skewed by chance occurrences or contamination; they also circumvent the caveat that individual species' ecological preferences might have changed since antiquity, since it is unlikely

[169] Bogaard *et al.* 2001; summarized in Bogaard 2011 p.206.
[170] Bogaard *et al.* 2001 p.1173. Data for vegetative regeneration were not readily available in published sources; assessments of relevant taxa in this project were kindly provided by J. Hodgson, pers. comm.
[171] Bogaard *et al.* 2001. I am grateful to Dr Bogaard for making the control data available to me.

that several different species will all have changed in the same way.[172] The wild/weedy species recorded in the dataset constitute a wide array of variables, and multivariate statistical approaches were therefore appropriate. As already noted, discriminant analysis was applied to investigate seasonality in sowing.[173] In addition to this, the exploratory technique of correspondence analysis was utilized. Correspondence analysis is an ordination technique that reduces many variables to two axes which account for the majority of variation in the data. In this case, samples are ordered by their compositional variations (*i.e.* their constituent species), while species are ordered by variations in their occurrence among samples. The two axes are used to produce scatter graphs, displaying the principal trends in the data. The origin (centre) of the graph represents typical, average composition; distance from the origin thus increases with a sample or species' deviation from the norm. Equally, the proximity between two samples or species is a measure of their similarity in composition or distribution.[174] Samples were coded by their origins and crop processing classifications, species by their ecological attributes, in order to explore the impact of these extrinsic variables upon trends in the dataset. Correspondence analyses were conducted using Canoco for Windows 4.51 and scatter graphs were produced with CanoDraw for Windows 4.1.[175]

Unless otherwise stated, the following criteria were applied in correspondence analyses, in order to exclude small samples whose contents are unlikely to be representative of their parent economies, and rare taxa whose occurrence may obscure patterns among the more common species. Samples each required a minimum abundance of ten items, and species each required a minimum presence of three samples.

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[172] G. Jones 1992 pp.135–137.
[173] See above, §3.9.5.
[174] Bogaard 2004 pp.92–94.
[175] Biometris 1997-2003; P. Smilauer 1999-2003.

3.10 Prospect

Most of the analytical methodologies described in this chapter have been developed and applied in studies of other regions and periods. In this study, they are brought to bear upon the question of Mid Saxon agricultural development for the first time. Moreover, while previous studies have considered individual aspects of Anglo-Saxon agriculture – *e.g.* Crabtree's work on animal husbandry, or Banham's work on edible plants – this research represents the first systematic, up-to-date attempt to synthesise the evidence from different (bio)archaeological sources, and so to consider agricultural development from a more holistic perspective. Hence, despite the limitations of the data and methods which have been outlined above, it is intended that their combined application will lead to new insights on a secure, empirical basis.

The results thus obtained are examined in detail and their wider implications considered in Chapters 5–8. Prior to these discussions, however, the next chapter will review evidence and environmental factors which have not been subjected to substantial original analysis by the present writer but which are pertinent to the issue of agricultural development, including the topographical and geological contexts of the study regions, and the evidence from palynology, sedimentation, entomology and malacology.

4 Archaeology & Environment in the Study Regions

4.1 Introduction

The previous chapters have outlined the key hypotheses to be examined, the principal categories of archaeological data to be analysed, and the methods for the collection and analysis of those data. Discussions of the results follow in Chapters 5-8, constituting the core of this thesis. To set the scene, this chapter assesses the wider archaeological and environmental contexts of the study regions, and examines the distribution of recorded sites in relation to various environmental factors. Consideration of the natural environment – including geology, topography, and hydrology – is crucial to an understanding of both taphonomy and agricultural resources in the study regions. This chapter also reviews those categories of archaeological and palaeoenvironmental evidence which, although not subjected to substantial original analysis in this project, may contribute to our understanding of Anglo-Saxon agriculture (artefacts, sedimentation, palynology, entomology, and malacology).

4.2 Environmental overview

The study regions constitute a broad transect across central southern Britain, stretching from the Severn estuary and Salisbury Plain in the west and south, to the Norfolk Broads and Fens in the east and north, encompassing a wide variety of landscapes in between which can usefully be summarized in terms of National Character Areas (Figure 4.1).[176]

[176] See above, §3.3.

Both study regions lie within the conventional Lowland zone of Britain, whose solid geology is chiefly characterized by soft, readily eroded rocks. The land seldom rises above 200m aOD.[177] The glacial scouring of the Fenland and London Basins has rendered much of the land in Region 2 (East Anglia and Essex) very low-lying, below 50m aOD, while much of the riverine landscape of Region 1 (Upper/Middle Thames valley and environs) tends to lie between 50 and 100m aOD. Some higher ground does occur, however, particularly in the limestone hills of the Cotswolds and along the west-to-east chalk spine which runs most prominently through the Berkshire and Marlborough Downs, Chilterns, and East Anglian Chalk (the so-called 'East Anglian Heights', Figure 4.2). These geological and topographical patterns contribute towards a broad climatic difference between east and west: the 'Atlantic' west experiences both higher rainfall and higher average temperatures than the 'Continental' east, which experiences lower average rainfall but also, being more exposed to the North Sea, greater extremes in temperature, especially on the Breckland plateau.[178] Although modern climatic data are not directly applicable to the Anglo-Saxon period, the *relative* patterns of the west-east climatic gradient do arguably retain some validity for this study, since they are partially topographically determined.

[177] Williamson 2013 pp.36–40. The following discussion also draws extensively upon the 'Natural Area' and 'Nation Character Area' profiles available from <www.naturalengland.org.uk>, accessed June 2013.
[178] Rothera n.d. p.7; Pryor 2010 p.22; Williamson 2013 pp.42–43.

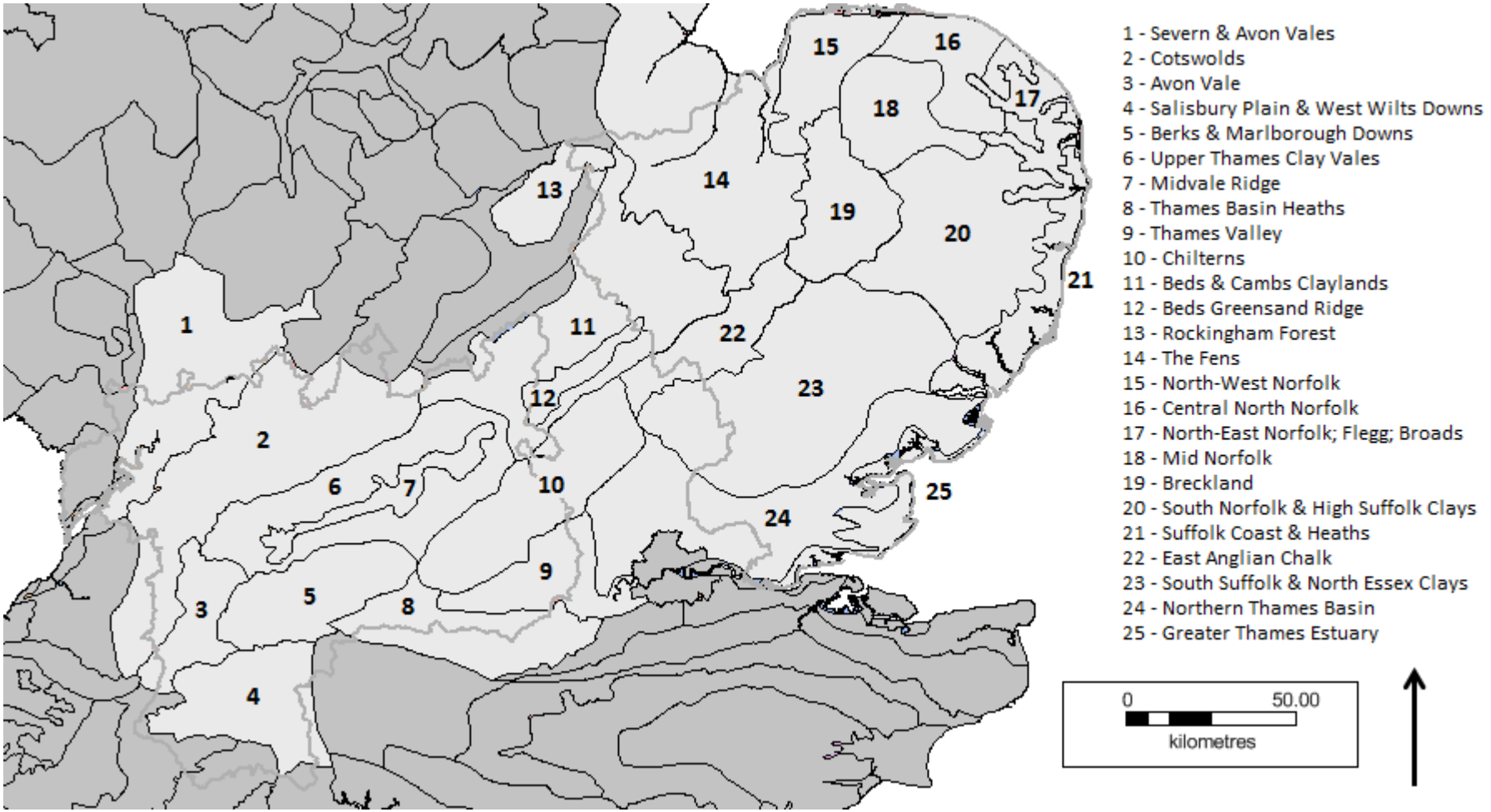


Figure 4.1 – Principal landscapes of the study regions, in terms of National Character Areas (Digital Mapping Data © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right 2013); <http://www.naturalengland.org.uk/nca>, accessed June 2013.

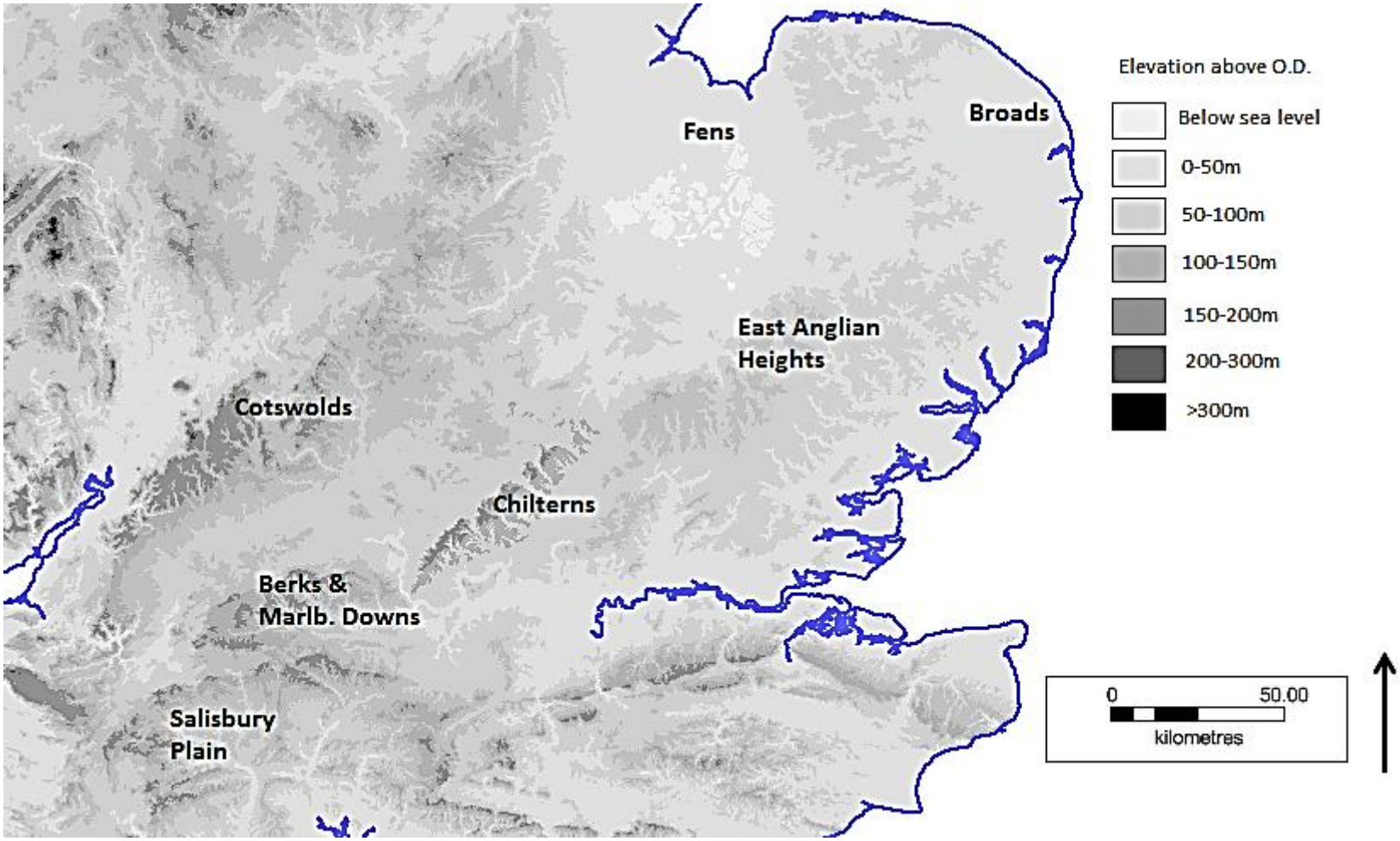


Figure 4.2 – Topography of southern Britain, with zones mentioned in main text (Digital Mapping Data, © Collins Bartholomew 1995).

Hydrology is also of interest since it may have exerted important influences on both agricultural environments and communication channels in antiquity.[179] Palaeohydrological studies indicate that certain changes have occurred in the study regions since the Anglo-Saxon period, most notably in the Fens and Thames valley. The Fens were subject to renewed but short-lived marine transgressions in the post-Roman period and defensive banks are known only from the Late Saxon period onwards; hence, the mutable coastline of the Early/Mid Saxon fenland will have been far inland of the modern coast, and sites such as Terrington St Clement (NO5) will have been correspondingly closer to the sea and its saline influences (Figure 4.3).[180] In the Thames valley, meanwhile, a more complex network of channels than is now seen should be envisaged, since much of the modern river system has been simplified through channelization and a long process of silting which appears to have resumed – after a post-Roman hiatus – in the Mid/Late Saxon period.[181]

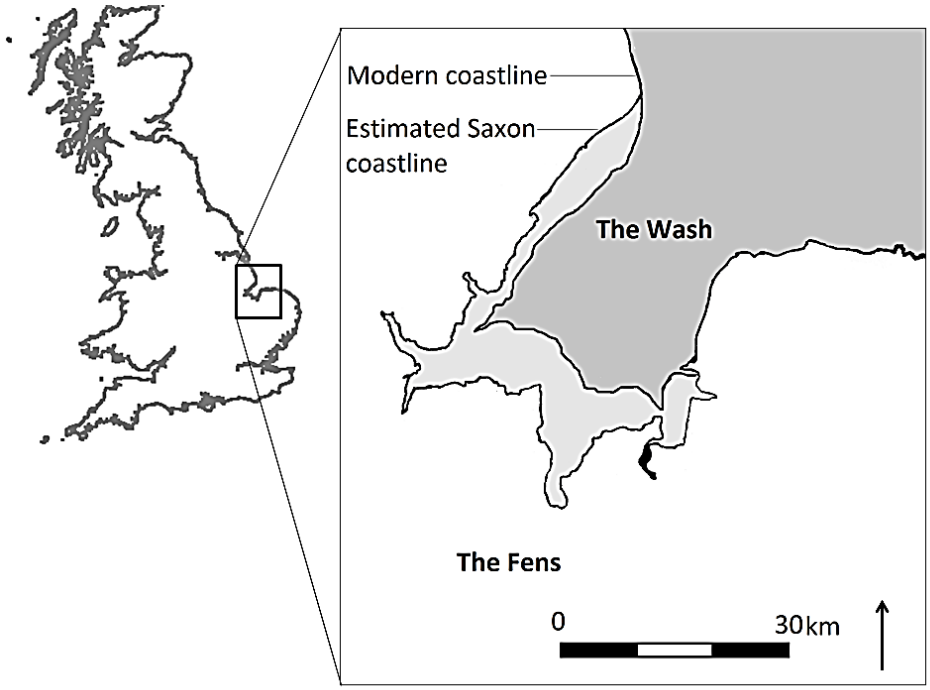


Figure 4.3 – Estimated changes in the fenland coastline – after Crowson *et al.* 2005 p.5, Fig. 1.

[179] Williamson 2013 pp.56–59; the study regions straddle all three of Williamson's 'drainage provinces'.
[180] Crowson *et al.* 2005 pp.4–11.
[181] Booth *et al.* 2007 pp.6, 18–20. See below, §4.6.

Such changes will not, however, have altered the basic hydrological patterns of the study regions, which are dominated by both the Thames and its many tributaries, which drain most of Region 1 and parts of Essex eastwards into the Thames estuary; and the Nene and Great Ouse and their tributaries, which drain most of Region 2 plus Milton Keynes north-eastwards into the Wash.

Of more marginal significance to the study regions are the Severn, the rivers Avon (Warks & Hants), and the various rivers draining eastwards from Norfolk, Suffolk and Essex, such as the Bure, Yare, Waveney, Stour and Blackwater (Figure 4.4).

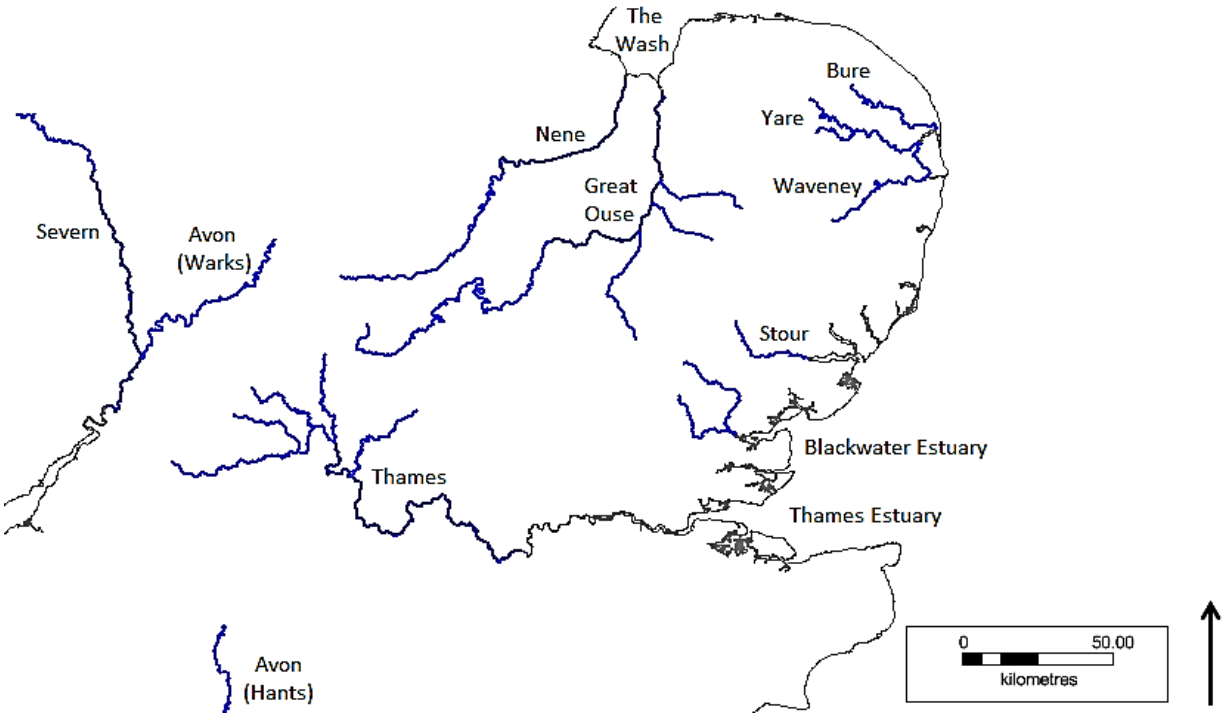


Figure 4.4 – Principal rivers in the study regions, as mentioned in main text (Digital Mapping Data © Collins Bartholomew 1995).

4.3 Geology

The study regions are characterised by a complex, variegated patchwork of soils, drift and solid geologies, and it is beyond the scope of this study to attempt a detailed assessment of the geological and edaphic influences upon the history of agriculture across these regions. However, since these factors will undoubtedly have been crucial in the development of farming practices, there follows a summary account of the principal landscapes occupied by the sites recorded in the project dataset and their main geological attributes. For brevity, sites are referred to by their gazetteer codes, as used in the county maps reproduced here for reference (Figure 4.5–4.13).[182]

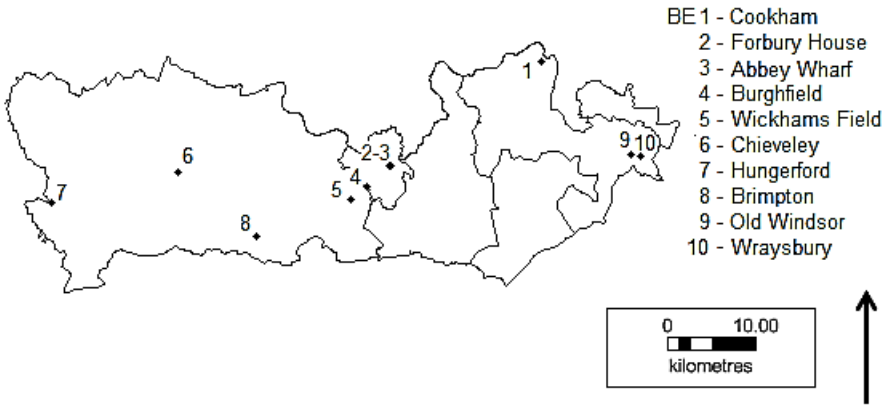


Figure 4.5 – Sites in Berkshire, with gazetteer numbers.

[182] See Appendix 1.

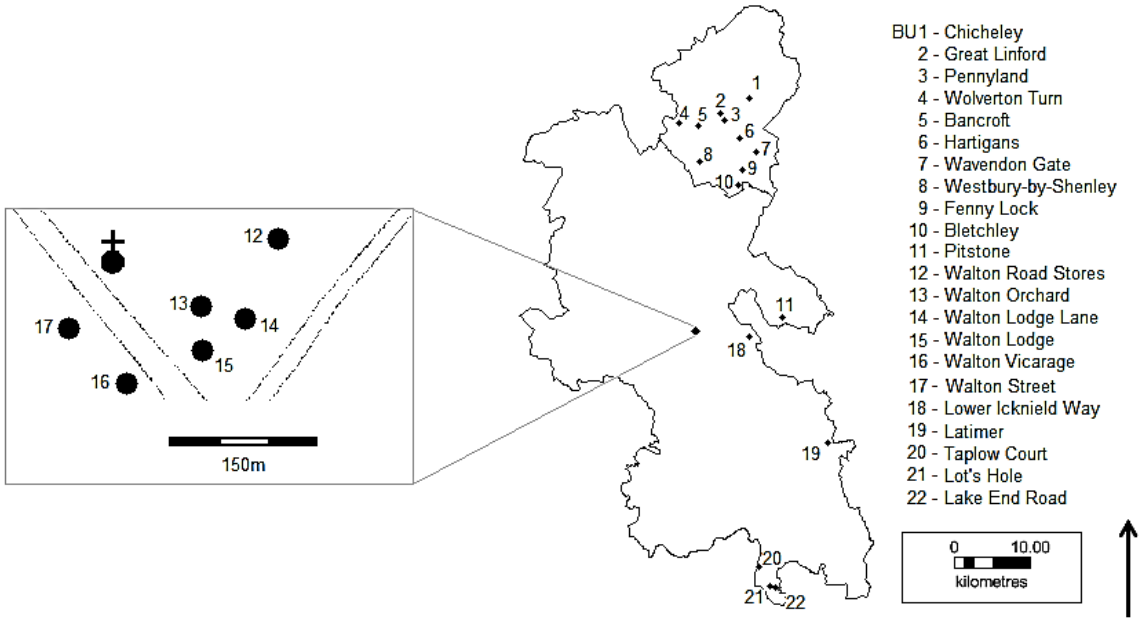


Figure 4.6 – Sites in Buckinghamshire, with gazetteer numbers.

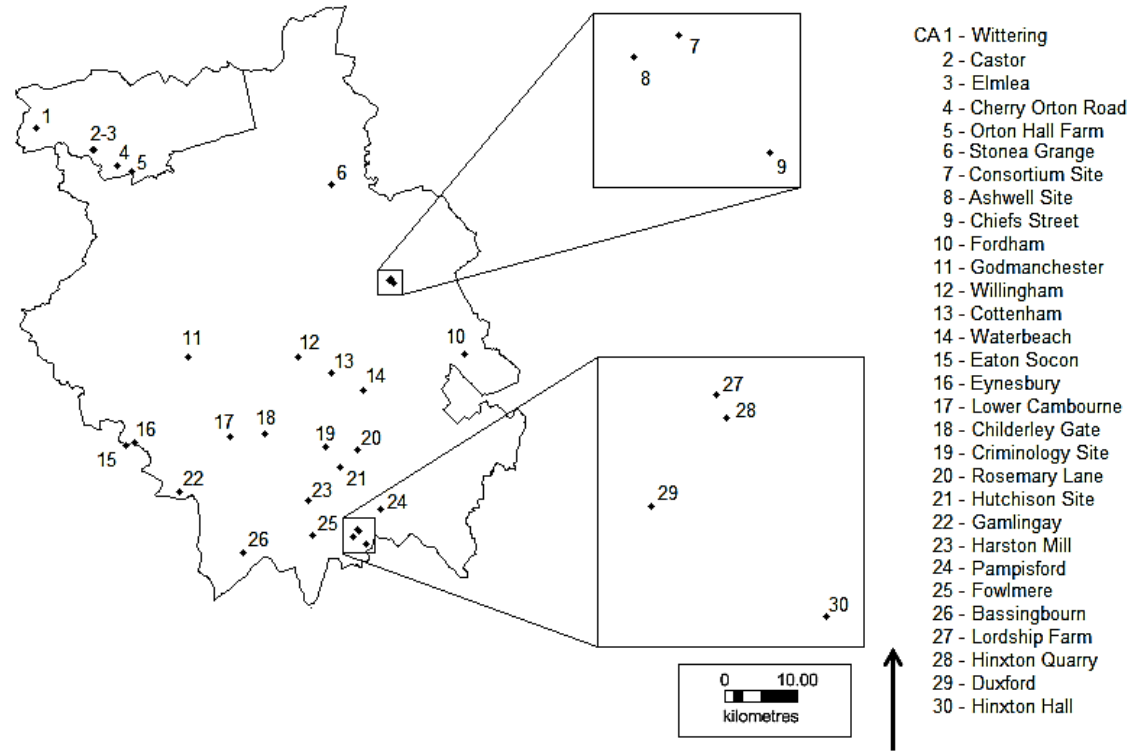


Figure 4.7 – Sites in Cambridgeshire, with gazetteer numbers.

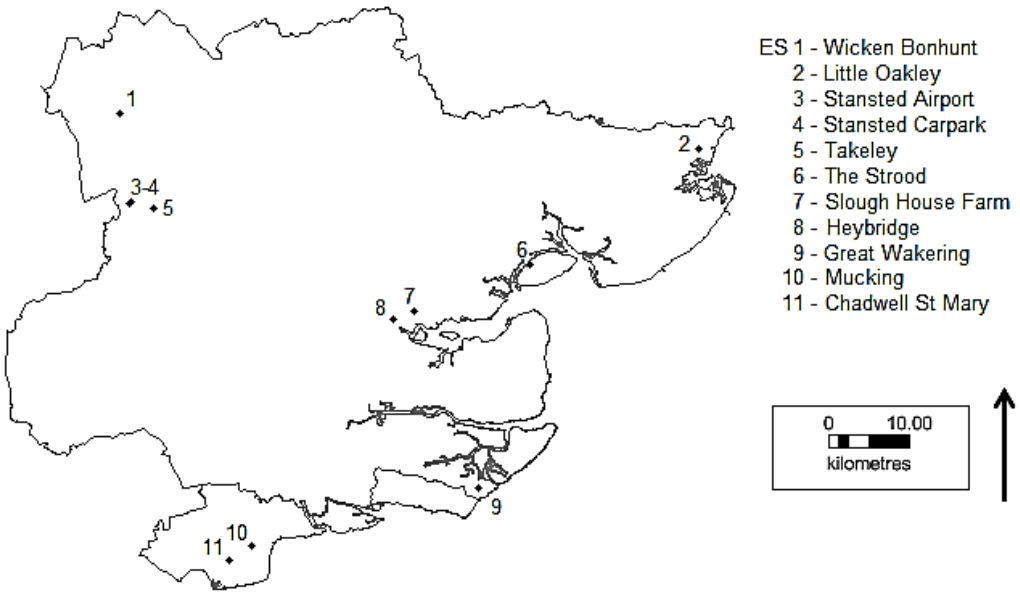


Figure 4.8 – Sites in Essex, with gazetteer numbers.

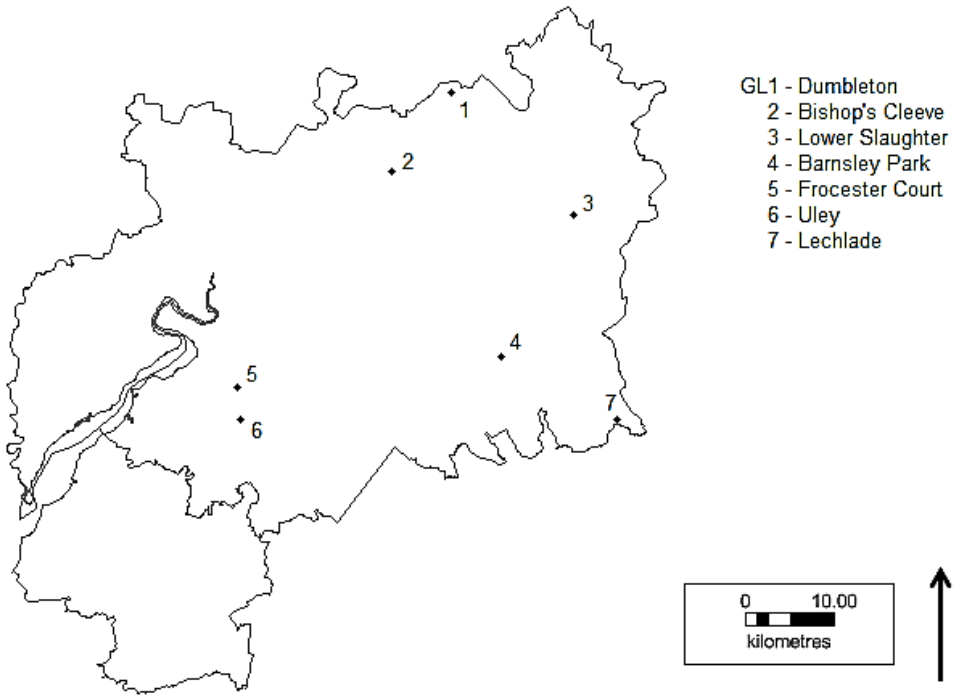


Figure 4.9 – Sites in Gloucestershire, with gazetteer numbers.



Figure 4.10 – Sites in Norfolk, with gazetteer numbers.

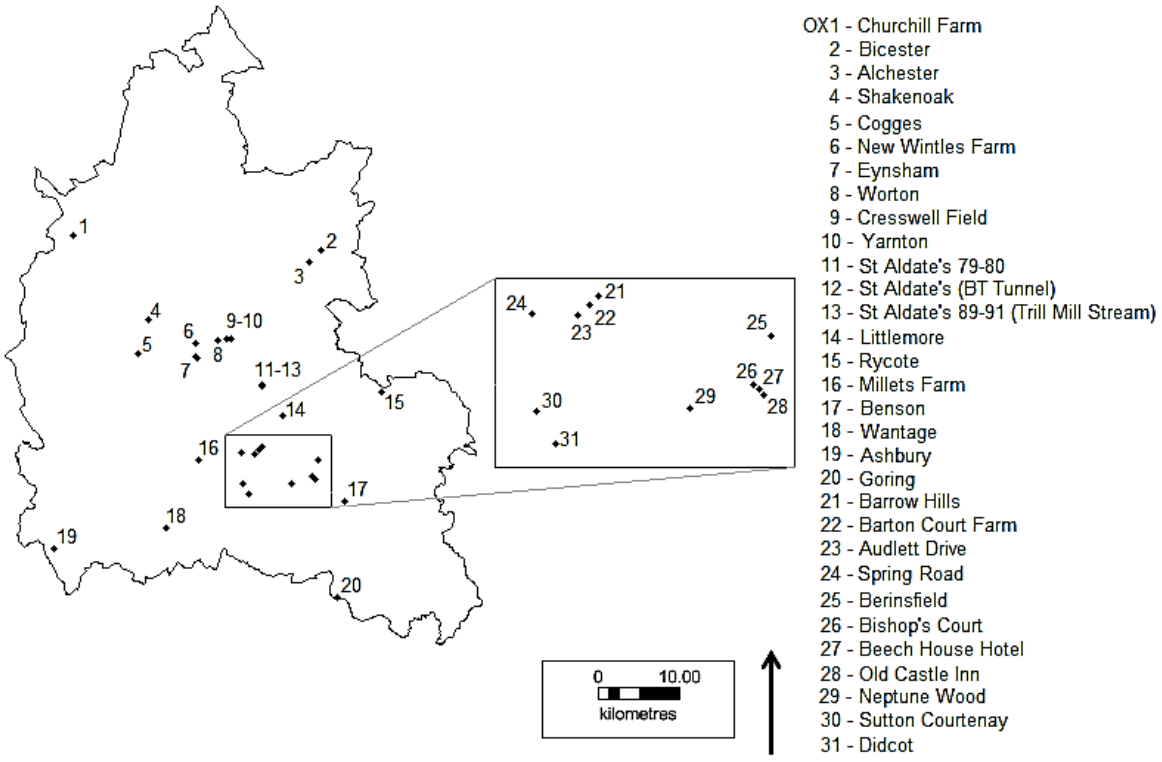


Figure 4.11 – Sites in Oxfordshire, with gazetteer numbers.

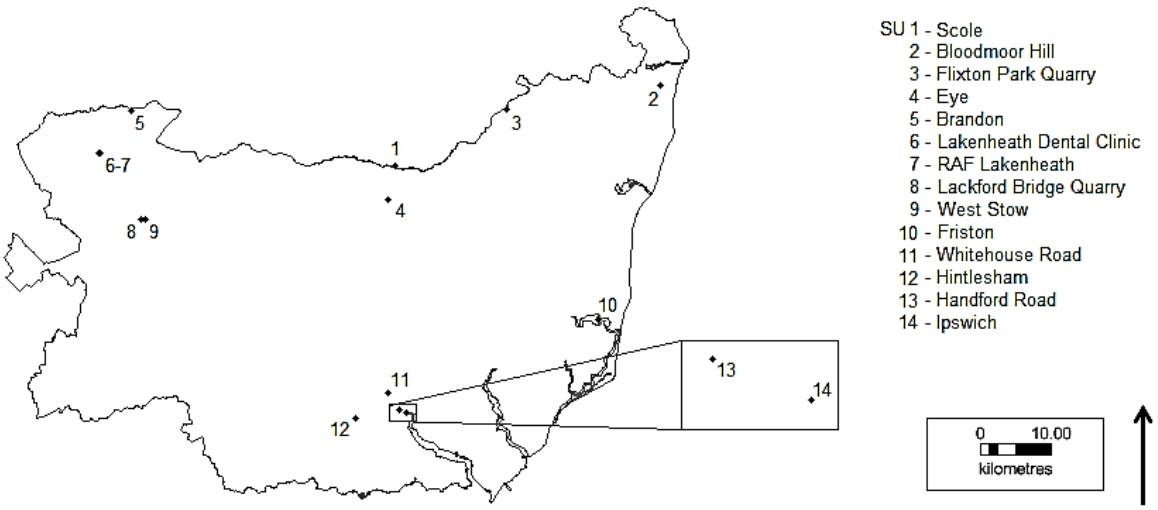


Figure 4.12 – Sites in Suffolk, with gazetteer numbers.

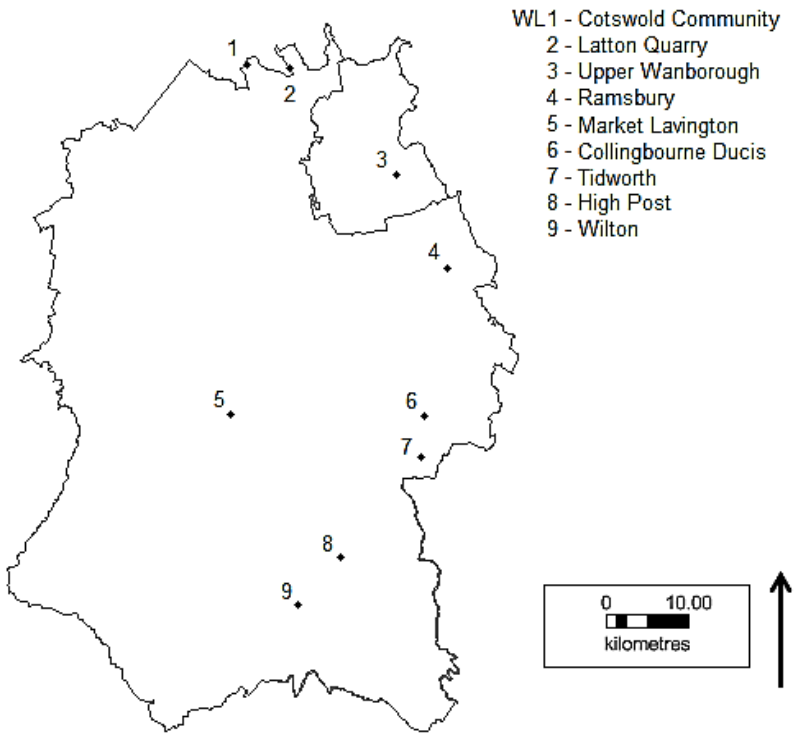


Figure 4.13 – Sites in Wiltshire, with gazetteer numbers.

It should be emphasised at the outset that few sites are surrounded by a uniform landscape; most lie close to the junction of two or more types of terrain. For instance, several sites seem well-placed to exploit both lower-lying river valleys with clays and gravel terraces, and also chalk/limestone uplands. Thus, the westernmost sites in the dataset lie between the Severn and Avon vales and the Cotswolds, with local access to both river terrace deposits and outlying spurs of the Cotswold limestone escarpment (GL1-2, 5). In the Cotswolds proper, while limestone is the prevailing substrate (GL4, 6; OX1), gravels also occur in the dissecting river valleys (GL3). To the south and east, where the well-drained brashy soils of the Cotswold dipslope meet the Upper Thames clay vales, sites are found near outcropping areas of limestone amongst the prevailing river gravels and Oxford Clay (OX2, 4-5). Hence, local populations in these areas would have been in fairly close proximity to heavy clays, lighter well-drained gravels, and thin brashy upland soils perhaps best suited to pasture.

To the south, three sites occur at the interface between the Gault Clay of the Vale of the White Horse and the greensand and chalky head deposits at the north-facing scarp of the Lambourn Downs (WL3, OX18-19). Further south in Wiltshire, around the edges of Salisbury Plain, sites are located close to the interface between outcrops of upland chalk and the intersecting, gravelly river valleys of the Bourne, Avon, Wylye and Nadder (WL6-8), while Market Lavington (WL5) lies on a greensand ridge between the chalk plateau of Salisbury Plain to the south and Gault Clays to the north, with peat and alluvium in the valley of the Easterton Brook palaeochannel below.

Moving eastwards to the Chilterns, although no sites in the dataset are found upon the chalk hills themselves, two occur where the northern escarpment meets the Gault Clay of the Vale of Aylesbury, with intervening chalky head deposits (BU11, 18). To the south, Latimer (BU19) lies on the chalk slopes of the alluvium-floored Chess valley, which runs south-east from the Chiltern dipslope.

Following the chalk north-eastwards into the East Anglian Heights, we find few sites upon the higher ground where the soils tend to be thin and nutrient-poor, although some sites do occupy lower-lying areas of chalk (CA20, 25-26). More typically, sites lie upon or near gravel terraces, where rivers dissect the chalk (CA10, 21, 23-24, 27-30).

Running between the chalk and limestone uplands, there are large concentrations of sites in the clay vales of the Upper Thames and its tributaries (GL7, WL1-2, OX3, 6-10, 17, 21-31), likewise in the Kennet valley to the south (WL4, BE7). These sites tend to be situated on the First (Floodplain) and Second (Summertown-Radley) gravel terraces, with their light free-draining soils, but could also have had access to the alluvial clays of the floodplains, and the heavy, relatively intractable soils of the Jurassic clays that constitute the prevailing solid geology of the valleys. The St Aldate's sites (OX11-13) are situated upon the floodplain (now in modern Oxford), and would have been associated with seasonally flooded islands of alluvial clay.[183] By way of contrast, some sites (especially OX14-16) would have had nearby access to the low hills of the 'Midvale Ridge' that rises between the clay vales, whose Corallian limestone gives rise to sandy soils akin to those of the East Anglian Breckland, considered below. Differently again, the cluster of sites in the Walton area of Aylesbury lies upon an outcrop of clayey, sandy Portland limestone to the east of the Upper Thames valley (BU12-17).

Continuing eastwards through the Middle Thames valley towards the Thames estuary, most sites lie upon river gravels (BE1-10, BU20-22, ES2, 7-11), sometimes overlain with brickearth (ES9), sometimes overlapping with the sandy, often acidic soils formed on the mottled clays and sands of the Reading Beds. The flinty gravel terraces here in the Middle Thames valley are often more acidic and less fertile than those of the Upper Thames.[184]

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[183] Dodd 2003 pp.12-16.
[184] Booth *et al.* 2007 p.6.

Much of the remaining landscape in the study regions can be characterised as claylands. The Bedfordshire and Cambridgeshire claylands, from Milton Keynes to the Fen edge, encompass a complex series of glacial sands, gravels and clays mostly giving rise to calcareous, moderately well-drained clayey soils, with some areas of better-drained ground occurring in the valleys of the Great Ouse, Nene and other rivers (BU1-3, 4-6, 7-10; CA4-5, 10-19). Other sites in the vicinity include Gamlingay (CA22), upon a low rise in the Bedfordshire Greensand Ridge; and Wittering (CA1), an iron-working site situated upon an outcrop of ironstone in the Rockingham Forest area.

The extensive claylands of the East Anglian Plain, spanning northern Essex and parts of Suffolk and Norfolk, largely encompass slow-draining clayey and loamy soils formed on chalky boulder clay, but with patches of sand, gravel and alluvium associated with river valleys; several sites are well-placed to access both types of terrain (ES1, 3-5; SU1, 3-4, 11-14; NO3-4, 9, 14). The neighbouring area of the Suffolk Coast and Heaths contains mostly light, easily-tilled sandy soils (notably in the 'Sandlings' region), but with a clay ridge near Bloodmoor Hill (SU2) and a complex series of sands, gravels and clays at Friston (SU10).

Free-draining sandy soils, often acidic and nutrient-poor, characterise the interior of the Breckland, although most Breckland sites in the dataset lie upon the sands and gravels of river valleys (NO15-20, SU8-9), while others lie closer to the richer, peaty soils where the Breckland meets the Fen edge (SU5-7). In the adjacent Fens, a distinction can be made between the inland peat fens ('Black Fens') and the marshier estuarine silt fens. Prior to modern extensive drainage, permanent settlement in the Fens was restricted to 'islands' raised above the wetlands. In the peat fens, Stonea Grange (CA6) lies upon such an island of sand and gravel, while the Ely sites (CA7-9) occupy an outcrop of sandstone, sands and Kimmeridge Clay. In the silt fens, each of the Fenland Management Project sites (NO5-7) lies upon a roddon, *i.e.* a raised bed of silt, while Outwell and Downham Market (NO11-13) lie upon sands and clays at the margin between the silt and peat fens.

Finally, in the north-easternmost part of the study regions, we find sites occupying river sands and gravels (NO1-2, 9), glacial sands near the coast (NO10), gravels overlying boulder clay (NO3-4), and the springline between Lower and Middle Chalk (NO8). No sites in the dataset occupy the wetlands of the Norfolk Broads.

4.4 Site distribution

As the foregoing discussion has revealed, and as the map below illustrates, the sites recorded in the project dataset are distributed very unevenly, with far denser concentrations occurring around the Upper Thames and Great Ouse valleys than in the East Anglian claylands or the far west of the study regions (Figure 4.14).

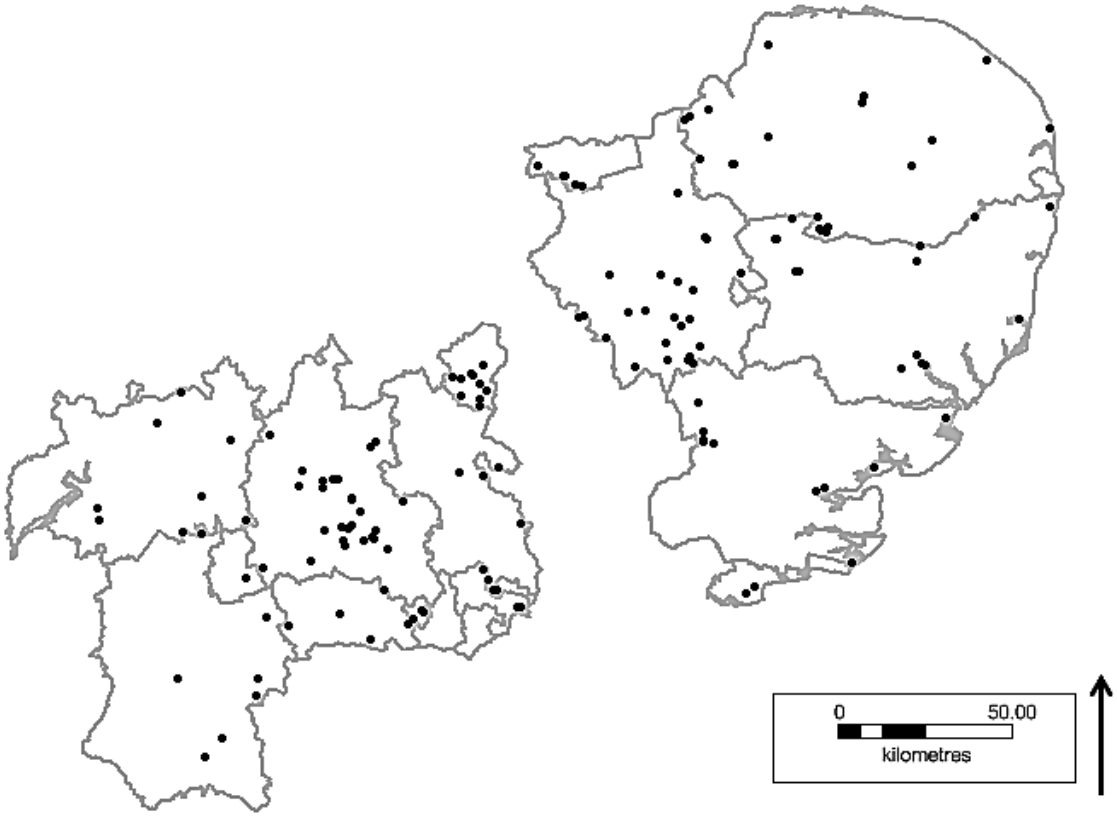


Figure 4.14 – Distribution of all sites recorded in the dataset (Digital Mapping Data © Collins Bartholomew 1995).

The patterns are worth examining because they may, firstly, reveal underlying biases in the preservation and recovery of material; and secondly, help to characterize prevailing geographical tendencies in the dataset at the outset, so that variations within the overall pattern may later be critically assessed.

The composition of the dataset is determined by the preservation, recovery and accessibility of structural, faunal and botanical remains in the archaeological record. Some of these factors may be systematically biased (*e.g.* the effects of geology on preservation), but

others are arbitrary (*e.g.* the effects of funding and scheduling on the volume and accessibility of data). The definition of a 'site' is also somewhat arbitrary, since some clusters of excavations could be treated individually or collectively depending upon the circumstances of discovery and publication. For instance, a cluster of sites within the Walton area of Aylesbury is so concentrated that it almost certainly represents a single settlement sequence, but in the absence of a comprehensive interpretative framework or synthetic publication, the sites are each considered separately here (BU12-17).[185]

The same reasoning has been applied to clustered sites in Oxford (OX11-13), Ely (CA7-9), Thetford (NO17-19) and Dorney (BU21-22). The composite site of Ipswich (SU14), however, is an important exception. It consists of a series of rescue excavations undertaken within the urban centre of modern Ipswich since 1974, and is taken to represent the Mid Saxon specialist craft and trading settlement of *Gipeswic*. At the time of writing, the excavations have not been fully published, either individually or collectively, and this study therefore follows Crabtree and Murphy in treating the site singly as 'Ipswich,' although intra-site distinctions have been preserved within the dataset where possible.[186] 'Ipswich' *sensu stricto* also forms a looser cluster with the separately recorded Whitehouse Road (SU11) and Handford Road (SU13) sites, both of which are associated with modern Ipswich but apparently peripheral to the Mid Saxon *emporium*.

Sites such as Ipswich, excavated as a result of urban development work, constitute a substantial portion of the dataset. This is true of the Walton cluster, for example, and likewise the marked concentration of sites in Milton Keynes, partly reflecting the prolific excavations that accompanied the creation of the new town there in the latter part of the 20th century.[187] Development-led excavation is likewise responsible for some non-urban sites in the dataset, *e.g.*

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[185] Farley 2008 p.11; Stone 2009 p.6.
[186] Murphy 2004 pp.8–9; Crabtree 2012 p.5.
[187] Zeepvat 1993.

those at Lakenheath (SU6-7).[188] Far fewer sites in the dataset represent research-led projects, such as those studied as part of English Heritage's Fenland Management Project (NO5-7), or the University of Reading's Lyminge Archaeological Project (Kent).[189]

Perhaps most significantly, gravel extraction has led to the discovery and excavation of several major sites in the study regions, including Yarnton (OX10) and Mucking (ES10). The scale of modern gravel extraction may to some extent be responsible for the strong distributional trend in the dataset towards gravel terraces, where the soils are also conducive to both cropmark identification and the preservation and recovery of bioarchaeological remains, as targeted by this study.[190] Besides this three-fold potential bias, such locations may have been genuinely favoured in antiquity because of their access to water supplies, riverine communications, and attractive, easily worked agricultural soils. Presumably, it is a combination of such factors that has resulted in concentrations of sites occurring on (or near) river gravels, particularly along the Thames and Great Ouse and their tributaries (Figure 4.15).[191]

[188] Various excavations at the RAF base have produced Early/Mid Saxon evidence, but only two archive reports could be accessed for use in this study: Caruth 2006 discusses the Consolidated Support and Family Support Complexes (SU7) while Tester 2006 reports on the Dental Clinic site (SU6).
[189] Crowson *et al.* 2005 p.1; Thomas 2009.
[190] Robinson 1992b p.48; Booth *et al.* 2007 p.1; Hamerow 2012 p.3.
[191] See also above, §3.2.1.

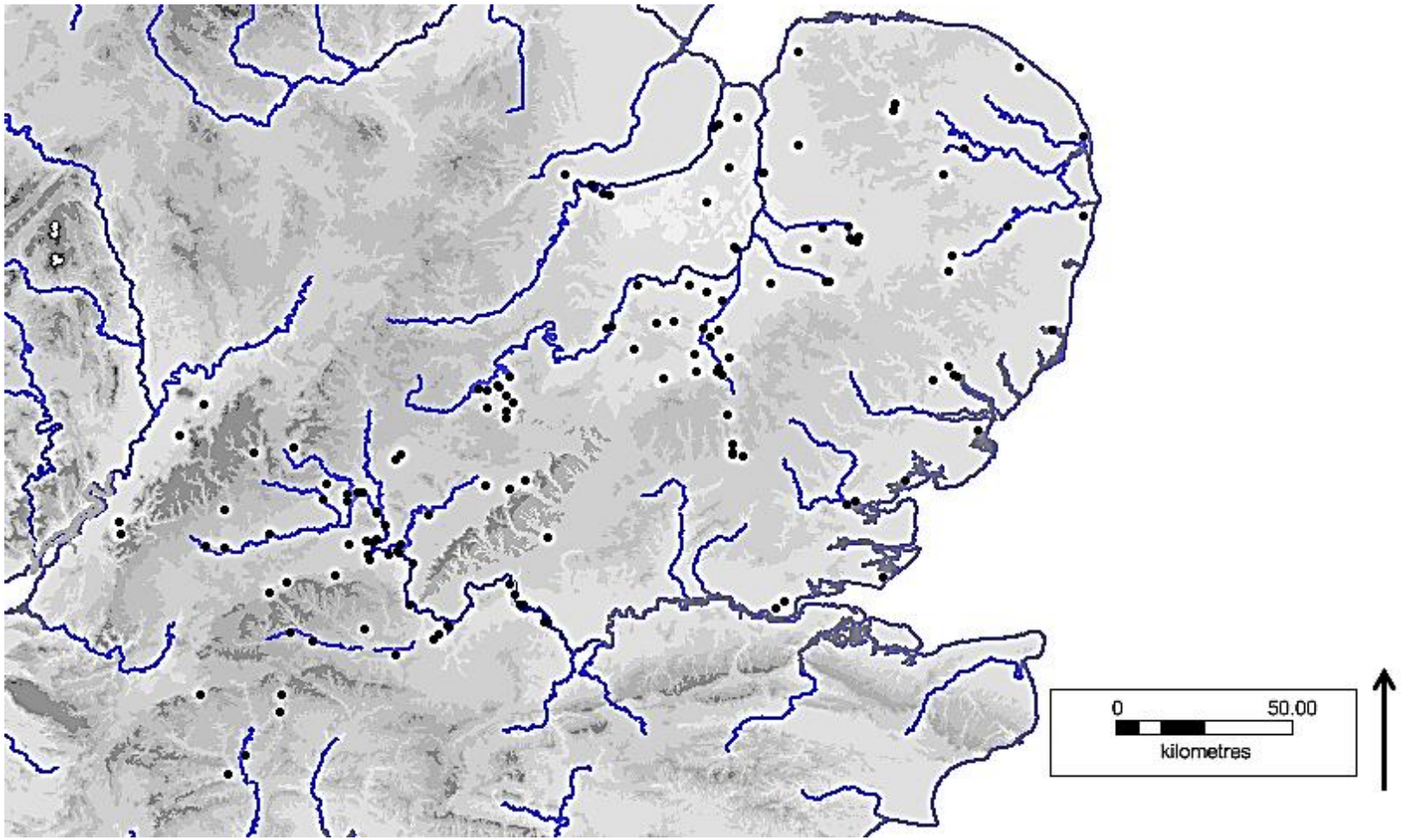


Figure 4.15 – Distribution of sites in the dataset, in relation to major rivers (Digital Mapping Data © Collins Bartholomew 1995).

4.5 Artefacts

Very few Early/Mid Saxon artefacts of agricultural function have been identified within the study regions. Perhaps the most common are quern stones, often recovered in a fragmentary state and only summarily published. A synthetic analysis of their composition, morphology and distribution would be instructive, but lies beyond the scope of this project.[192]

Iron artefacts were especially scarce, perhaps because they were normally recycled so as not to waste iron. Possible iron farming implements encountered in the study regions included (i) 'cowbells' (or their clappers) for attachment to free-ranging livestock, although their pastoral function is essentially conjectural; [193] (ii) pruning hooks, not all securely dated; (iii) sickles or reaping hooks, again not all securely dated; and (iv) shears which, although they may have had broadly agricultural uses such as wool-clipping or straw-cutting, could well have served multiple functions.[194] Hence, agricultural artefacts were not found to be sufficiently numerous, complete or diagnostic to constitute a corpus that could usefully be studied for chronological, geographical or typological patterning.

[192] See further below, §7.4.
[193] *E.g.* Brodribb *et al.* 2005 p.238.
[194] Hey 2004 p.82.

4.6 Palaeoenvironmental evidence

Besides the animal bones and plant macrofossils that are studied in subsequent chapters, additional information may be gleaned from the evidence of pollen, insects, molluscs and sediments analysed within the study regions (Figure 4.16).

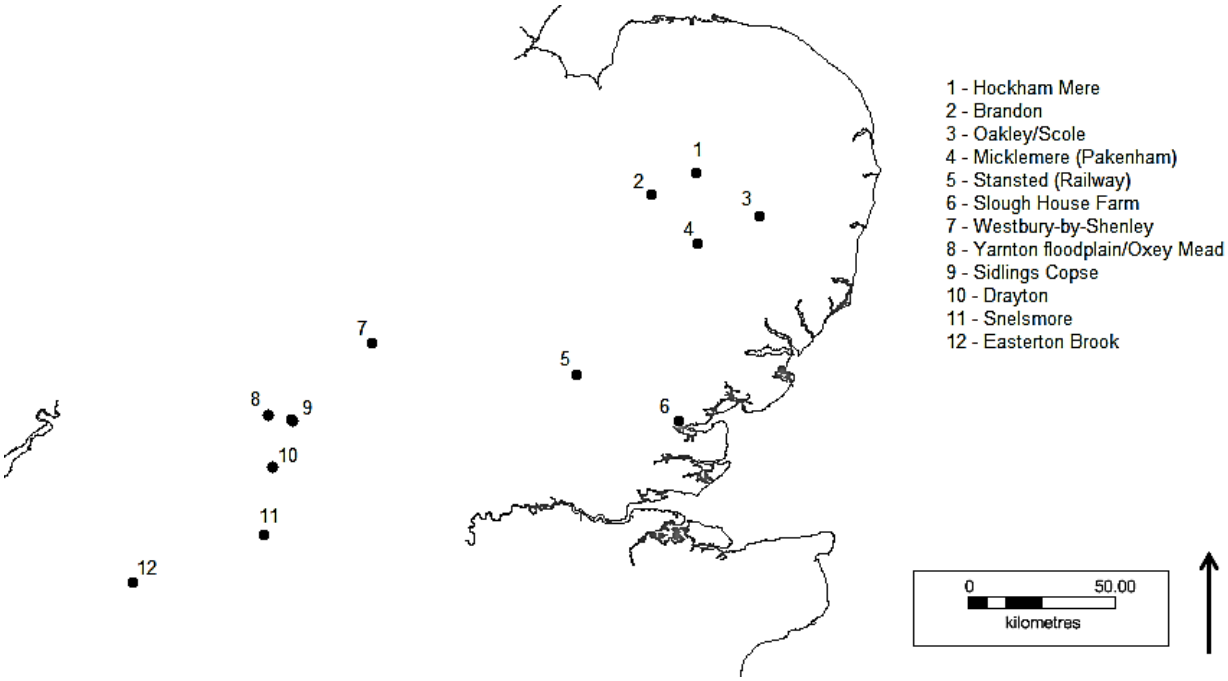


Figure 4.16 – Sites with palaeoenvironmental sequences mentioned in main text (Digital Mapping Data © Collins Bartholomew 1995).

Pollen grains are reproductive cells which travel within and between plants to enable fertilization; they are microscopic, and therefore distinct from the macrofossils (such as seeds) whose study is central to this project.[195] Although not systematically collected or analysed in this thesis, palynological studies spanning the 5th-9th centuries were available from several sites in the selected regions. Their significance for agricultural archaeology is twofold: firstly, in elucidating the wider vegetation history of an area beyond the immediate environs of an excavated site; and secondly, in revealing the occurrence of taxa which typically leave little or no trace in the plant macrofossil record.

[195] Cappers & Neef 2012 pp.132–134.

Much of this evidence derives from 'off-site' pollen sequences which, having accumulated in channels or lakes set apart from sites of known human activity, have the potential advantages of relatively undisturbed stratigraphy and an extended chronological span.[196] The sequences discussed here have also benefited, to varying degrees, from radiocarbon dating. Some more poorly-dated sequences have been omitted from this discussion.[197]

Some pollen sequences indicate little or no vegetational change over this period. At Sidlings Copse (Oxon), for instance, open grassland appears to have prevailed from the Roman to the Late Saxon period.[198] There are several sequences, however, in which an increased percentage of cereal pollen has been taken to indicate an increased emphasis on crop husbandry in the Mid Saxon period.[199] This inference, in itself, is slightly problematic. With the exception of rye, cereals release little pollen to the air, and what is released travels only short distances; cereals may therefore be systematically under-represented unless grown and/or processed in the immediate vicinity of the catchment, and unimpeded by tall vegetation.[200] Hence, fluctuations in cereal pollen could reflect changes in the location, rather than the extent, of cereal cultivation and/or processing. Moreover, the presence of cereal pollen could be explained, as Greig suggests with regard to the Yarnton floodplain sequences, by consumption in fodder and redeposition in the dung of grazing livestock, rather than by local cultivation or processing.[201]

Levels of cereal pollen need not, therefore, correlate directly with the extent of cultivation, just as levels of grassland pollen need not be a direct reflection of the extent of local grazing land. While a decline in the proportion of grassland pollen could indicate that grazing land was being

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[196] Dark 2000 p.2.
[197] *E.g.* Diss Mere and Old Buckenham Mere in Norfolk, 'dated only by cross-correlation and conjecture' (Wiltshire in Ashwin & Tester (in press) p.266).
[198] Day 1991 p.467.
[199] Rippon 2010 pp.58–59; Hamerow 2012 p.147.
[200] Wiltshire 1990 p.19; Hale in Ivens *et al.* 1995 pp.416–417; Dark 2000 p.5; Wiltshire in Williams & Newman 2006 pp.124–125.
[201] Greig in Hey 2004 p.377.

turned over to crop husbandry – as perhaps represented in the Oakley palaeochannel – it has been suggested that a decline might equally have been caused by more intensive grazing, such that flowering and pollen dispersal were inhibited.[202]

Given these caveats, the palynological evidence should be treated with some caution: arable expansion is a plausible but not exclusive interpretation of increased levels of cereal pollen, and would in any case apply only to the immediate vicinity of the catchment. Nonetheless, it is instructive to consider the chronologies of those sequences in which increases in cereal pollen have been identified. A Mid Saxon date is plausible for the increase at Hockham Mere, but the temporal resolution is too poor to allow chronological precision.[203] At Brandon, the increase follows a local conflagration event that occurred around the early/mid-7th century, and seems to accompany the foundation of the probable monastic settlement nearby.[204] At Micklemere, the increase is said to occur from 1290±100 b.p. onwards, interpreted in the original report as 'a.d.660' although *OxCal* (IntCal09) now suggests a calibrated range of cal.AD 580-971 (at 95.4% confidence).[205] In the Oakley palaeochannel sequence, an increase in cereal pollen is dated between cal.AD 670-820 and cal.AD 710-890, but is preceded by an earlier, slighter increase in cereal pollen, estimated to occur between AD 445 and cal.AD 670-820.[206] At Stansted, the increase in cereal pollen is thought to begin partway through a sequence dated cal.AD 530-680.[207] Hence, in East Anglia and Essex, it is possible that the putative increased emphasis on cereal cultivation began as early as the 7th century in some areas, but this should be seen as a *terminus*

[202] Wiltshire in Ashwin & Tester (in press) p.272.
[203] Sims 1978 p.58, suggesting the uncalibrated dates '1,300-1,140 bp'.
[204] Wiltshire 1990 pp.12–15.
[205] Wiltshire 1988; *OxCal* 4.2 © C. Bronk Ramsey 2013.
[206] Wiltshire in Ashwin & Tester (in press) pp.271–273.
[207] Wiltshire and Murphy in Havis & Brooks 2004 pp.353–354.

post quem. In the Easterton Brook palaeochannel sequence near Market Lavington (WL5), by contrast, the development is not evident until cal.AD 770-950.[208]

The argument that rising cereal levels in these pollen sequences reflect an expansion in arable farming is strengthened by the recognition of increased sedimentation, often in the very same deposits. Such sedimentation/alluviation is frequently interpreted as a sign of increasing local erosion consequent on expanding cultivation in the Mid/Late Saxon period, following a post-Roman hiatus. Such is the case, for example, at Brandon, Micklemere and Oakley where, as already observed, the putative arable expansion phase may have begun as early as the 7th century.[209] In the Upper Thames valley, however, sedimentation at the Drayton and Yarnton floodplains appears to have accelerated only from the 9th century onwards.[210] Such evidence arguably reinforces the case for inferring Mid Saxon arable expansion – first in East Anglia, and later in the Upper Thames valley – but could entail some further difficulties. Eroded sediments may introduce older palynological material into deposits as they accumulate, and thus create a spurious profile of local vegetation history; such contamination could also problematize radiocarbon dating.[211]

There may also be some chronological patterns in the occurrence of non-cereal crop taxa in the pollen record. Grape (*Vitis*) pollen appears at Oakley somewhere between the 7th and 9th centuries, but is not evident in the Easterton Brook sequence until around the 10th century.[212] Hemp/hop (*Cannabis*-type) pollen occurs in sequences at Brandon, Oakley, Slough House Farm,

[208] Wiltshire in Williams & Newman 2006 pp.124–127.
[209] Wiltshire 1990 pp.14–15; Wiltshire in Ashwin & Tester (in press) p.272; Murphy 1994 pp.29–31.
[210] Booth *et al.* 2007 pp.19–20.
[211] O'Connor & Evans 2005 p.85; Bennett 1983 p.464.
[212] Wiltshire in Ashwin & Tester (in press) p.273; Wiltshire in Williams & Newman 2006 p.129.

Easterton Brook, Yarnton floodplain, and a poorly-dated sequence at Snelsmore; none of these occurrences is demonstrably earlier than the 7th century.[213]

There is also some potential for palaeoentomology and malacology to inform upon Anglo-Saxon farming practices in the study regions. Robinson's study of Coleoptera and molluscs, for example, suggests that hay meadows were managed at Oxey Mead in the early medieval period, beginning somewhere between the 7th and 9th centuries.[214] In a study by Smith and Kenward, meanwhile, grain pests appear on current evidence to have become virtually extinct after the Roman period, perhaps because their favoured habitats (large open grain stores) declined after the Roman withdrawal, although we should be wary of arguing from negative evidence.[215]

[213] Wiltshire 1990 pp.14–15; Wiltshire in Ashwin & Tester (in press) p. 273; Wiltshire in Wallis & Waughman 1998 pp.186–187; Wiltshire in Williams & Newman 2006 p.126; Greig in Hey 2004 p.377; Waton 1982 p.76.
[214] Robinson 2011 p.53; Robinson in Hey 2004 p.408.
[215] Smith & Kenward 2011 pp.249–250, 257.

4.7 Prospect

This chapter has documented the general environmental and archaeological patterns that characterise the study regions. Certain west-east contrasts have begun to emerge: not only climatically and geologically, but also in the (admittedly sparse) palynological and sedimentary sequences which could reflect arable expansion and diversification from the 7th century in East Anglia, and from the 9th century in the west of the study regions.

These considerations provide the environmental context within which to consider the archaeological datasets which constitute the core of this study, and which are analysed in the following four chapters, beginning with the evidence for animal husbandry – faunal remains and droveway/paddock complexes – in Chapter 5.

5 Animal Husbandry

5.1 Introduction

This chapter addresses the related hypotheses that animal husbandry in the Mid Saxon period became (i) more focused upon sheep husbandry; (ii) more specialized, often with an increased emphasis on secondary products; and (iii) more closely managed in spatial terms, through the use of paddocks and droveways. To this end, most of the chapter is devoted to a comparative analysis of 5th-9th century faunal assemblages from the study regions, considering the relative abundance, mortality profiles, and sexing and pathological data for cattle, ovicaprids and pigs.

The informative potential and limitations of each strand of evidence are first assessed in terms of chronological and geographical distributions, abundance of data, and inter-worker variability. The data are then analysed in more detail. Firstly, the question of whether or not sheep increased in importance in this period is addressed using relative taxonomic abundance data. Secondly, mortality profiles are used alongside sexing and pathological data, in a consideration of the evidence for specialized herd management among the faunal assemblages. Thirdly, the distribution of paddocks, droveways and causeways is considered, and compared with patterns in the zooarchaeological data. A final, synthetic section considers what the evidence as a whole can reveal about patterns in animal husbandry in Mid Saxon England.

5.2 Assessment of the faunal dataset

5.2.1 Selection of assemblages

Faunal remains constitute the most prolific category of evidence in the project dataset, being represented at 122 sites in the study regions. Taxonomic abundance data – measured by NISP – are available for all of these sites, in 155 separate assemblages (where 'assemblages' are subdivided by site, period and method of retrieval). 62 of these assemblages (40% of all recorded) each contain at least 300 specimens identified to the three main domesticates. These 62 assemblages – all of which are dominated, where specified, by hand-retrieved material, often to the complete exclusion of sieved material – are here deemed to be sufficiently abundant for quantitative analysis, in accordance with the selected quorum of 300 NISP.[216] This quorum is here considered to retain enough of the total available dataset to admit meaningful comparative analysis, and the omission of the smaller assemblages (<300 NISP) does not greatly reduce the geographical coverage of the usable dataset (Figure 5.1). Data for the selected assemblages are presented in Table 5.1.

[216] See above, §3.7.1.

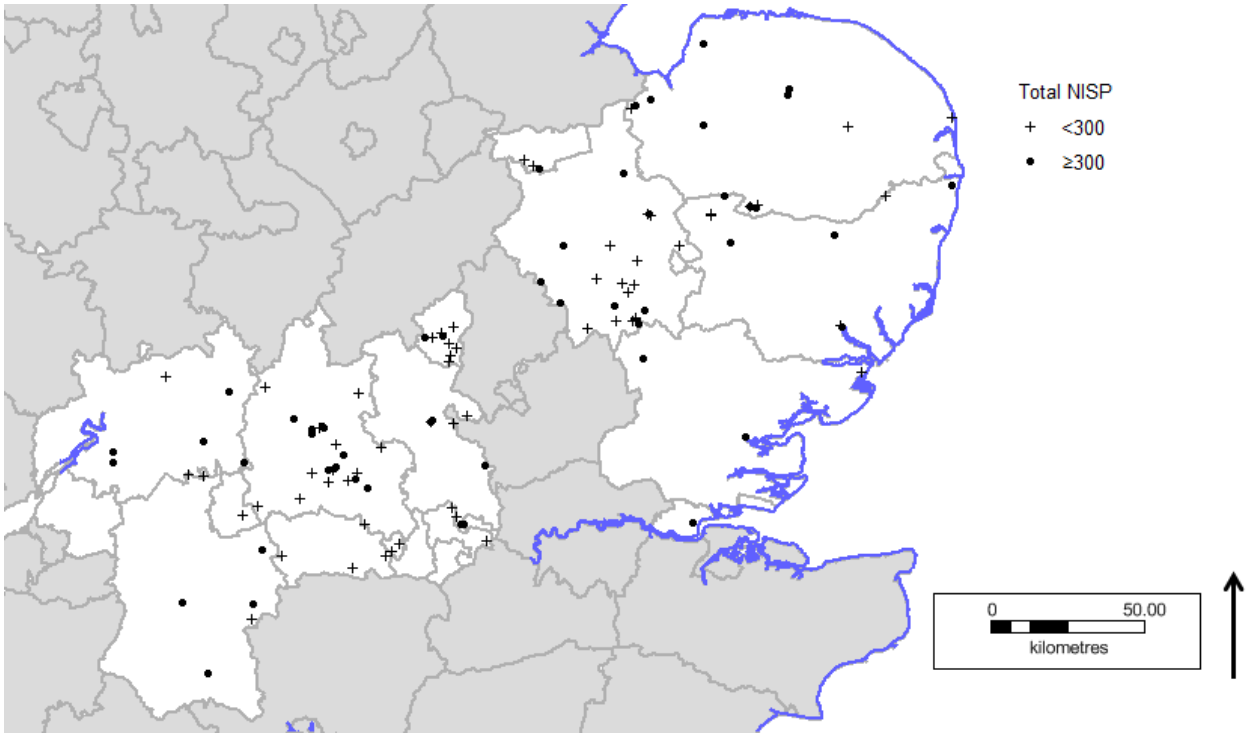


Figure 5.1 – Map of sites with quantified faunal assemblages, coded by total NISP (Digital Mapping Data © Collins Bartholomew 1995).

Table 5.1 – Data for selected faunal assemblages (≥300 NISP).

assemblage	county	chronology	% cattle	% ovicaprid	% pig	total NISP
Barnsley Park	Glos	Sub-Roman (not closely datable – C5 or later)	35.3	52.0	12.7	3,630
Beech House Hotel	Oxon		87.5	6.0	6.5	1,349
Frocester Court	Glos		61.9	25.0	13.2	805
Heybridge	Essex		82.9	9.0	8.1	456
Latimer	Bucks		83.6	4.6	11.9	438
Old Castle Inn	Oxon		60.6	26.3	13.1	878
Orton Hall Farm	Cambs		65.1	31.1	3.7	5,499
Shakenoak	Oxon		28.7	48.3	23.0	2,785
Stonea Grange	Cambs		40.3	50.8	8.9	807
Uley	Glos		12.6	84.3	3.1	11,163
West Stow (5th c. SFBs)	Suffolk	C5	33.0	45.2	21.9	7,701
Barton Court Farm	Oxon	C5-6	28.9	43.9	27.1	1,304
Eynesbury	Cambs	C5-6	35.3	41.0	23.7	532
Barrow Hills	Oxon	C5-6	52.6	38.9	8.5	13,893
Brettenham	Norfolk	C5-6	61.9	28.1	10.0	462
Eynsham (2a)	Oxon	C6	35.8	45.3	18.8	642
West Stow (Visitor Centre)	Suffolk	C6	42.6	50.7	6.7	2,146
West Stow (6th c. SFBs)	Suffolk	C6	35.2	50.8	14.0	13,667
Spong Hill	Norfolk	C6±	86.7	10.3	3.0	731
Eye	Suffolk	C5-7	46.8	25.6	27.6	2,105

assemblage	county	chronology	% cattle	% ovicaprid	% pig	total NISP
Hinxton Hall	Cambs	C5-7	38.9	45.0	16.1	329
Littlemore	Oxon	C6-7	59.2	23.5	17.3	515
Spring Road	Oxon	C6-7	39.7	35.4	24.9	506
Mucking	Essex	C5-7/8	71.9	13.4	14.7	2,116
West Stow (unphased)	Suffolk	C5-7/8	44.8	42.3	12.9	39,481
Bloodmoor Hill	Suffolk	C6-7/8	61.2	18.3	20.5	2,946
Wicken Bonhunt (1)	Essex	C7±	21.2	16.8	61.9	386
Market Lavington	Wilts	C7±	55.4	27.0	17.7	1,127
Wilton	Wilts	C7±	59.2	32.4	8.4	747
Benson	Oxon	C7±	51.8	33.6	14.6	438
Lechlade	Glos	C7±	60.0	35.4	4.7	427
Redcastle Furze	Norfolk	C7±	48.2	36.5	15.3	1,141
Pampisford	Cambs	C7±	45.1	41.6	13.3	1,270
Walton Street	Bucks	C7±	42.7	42.7	14.6	335
Walton Lodge	Bucks	C7±	37.2	45.8	17.0	382
West Stow("7th c. ditches")	Suffolk	C7±	35.6	46.1	18.3	2,754
Eynsham (2b)	Oxon	C7±	19.8	57.2	23.0	1,768
Godmanchester	Cambs	C7±	27.2	65.9	7.0	618
Gamlingay	Cambs	C7±	44.0	36.6	19.4	1,083
Brandon	Suffolk	C7-9	28.5	52.2	19.3	47,214
Collingbourne Ducis	Wilts	C7-9	40.6	53.6	5.8	795
Ipswich	Suffolk	C7-9	44.5	22.9	32.5	9,618
Yarnton (Ph. 2-3)	Oxon	C7-9	57.1	28.6	14.3	545
Cresswell Field	Oxon	C7-9	56.4	30.0	13.6	353
Lower Slaughter	Glos	C7-9	34.2	45.8	20.0	325
Wicken Bonhunt (2)	Essex	C8-9	17.2	12.9	70.0	29,950
Lake End Road	Bucks	C8-9	51.4	17.2	31.4	4,100
Lot's Hole	Bucks	C8-9	50.9	28.8	20.3	385
Ramsbury (1)	Wilts	C8-9	40.6	29.6	29.8	835
North Elmham Park	Norfolk	C8-9	31.9	39.4	28.7	7,599
Terrington St Clement	Norfolk	C8-9	50.3	43.6	6.1	312
Consortium Site	Cambs	C8-9	41.9	46.6	11.5	1,304
Walpole St Andrew	Norfolk	C8-9	45.8	49.1	5.1	393
Wolverton Turn	Bucks	C8-9	32.4	49.9	17.6	629
Sedgeford	Norfolk	C9	21.0	57.9	21.1	615
Ramsbury (2)	Wilts	C9	40.4	27.7	31.9	1,107
Marham	Norfolk	C9	59.7	34.4	5.9	544
Walton Vicarage	Bucks	Generic (not closely datable within C5/6-9)	41.7	35.4	22.9	1,445
New Wintles Farm	Oxon		52.8	35.6	11.7	824
Pennyland	Bucks		48.9	37.3	13.8	2,394
Walton Road Stores	Bucks		47.0	38.1	14.9	509
Harston Mill	Cambs		43.6	43.5	12.9	4,104

The chronological precision applicable to the faunal assemblages varies greatly between sites. At West Stow, for example, five different assemblages can be differentiated: one representing SFBs of 5th century date, another SFBs of 6th century date, a third – again thought to be of 6th century date – representing the more recent Visitor Centre excavations, a fourth representing ditches of 7th to early 8th century date, and a fifth representing features that cannot be closely dated within the span of occupation (5th to early 8th centuries). At Ramsbury, too, it is possible to differentiate between two phases, dated to the 8th to early 9th centuries, and later 9th century, respectively. Conversely, at Yarnton for example, the faunal remains belonging to Phases 2 and 3 (7th-8th and 8th-9th centuries, respectively) are not differentiated in the published report; hence, the composite data are here treated as a single Mid Saxon (7th-9th c.) assemblage.[217]

The presumed chronologies of the 62 selected assemblages are detailed in Table 5.1.[218] To summarize, ten are considered Sub-Roman, 13 Early Saxon, a further three are predominantly 'Early' but with some continuity into the early 8th century; 13 are deemed Intermediate; 18 are Mid Saxon; and five are Generic, *i.e.* not closely datable. Thus, unlike in much of the archaeobotanical dataset, the distributional bias in favour of the Mid Saxon period is very slight among these assemblages, and there is no clear correlation between chronology and total NISP (*i.e.* assemblages do not become appreciably bigger or smaller over time). This contrasts markedly with the charred plant macrofossils, which become strikingly more abundant in the Mid Saxon period than earlier,[219] but the contrast is not in itself significant. The taphonomic processes behind each dataset are substantially different: for instance, charred plant remains result from accidents in storage and processing, whereas faunal deposits are the inevitable by-product of

[217] See above, §3.5, for the dating methodology and terminology employed in this study.
[218] There are inevitably some ambiguities in this system: *e.g.* the Barton Court Farm assemblage is here termed 'Early Saxon', but could arguably be classed as 'Sub-Roman'; likewise, *vice versa*, with Orton Hall Farm.
[219] See below, §6.5.

butchery and are prone to different detrimental factors (*e.g.* destruction through gnawing by rodents).

5.2.2 Inter-worker variability

There is, in theory, considerable potential for inter-worker variability in the zooarchaeological dataset. The 62 selected assemblages were analysed or co-analysed by 45 zooarchaeologists, besides the assemblage from Shakenoak (Site F) which was analysed by the authors of the excavation report. The most prolific zooarchaeologists are B. Noddle (five assemblages from five different sites) and P. Crabtree (six assemblages, one from Brandon and five from West Stow). Most of the zooarchaeologists represented, however, worked upon the material from only one or two assemblages each.

The potential inconsistencies arising from this variability are to some extent mitigated by the focus upon relatively simple faunal attributes: the relative taxonomic abundance of three common taxa, and mandibular ageing data derived via largely standardized procedures.

Where stated in available reports, methods for quantifying taxonomic abundance by NISP were examined and compared, and few substantial differences were found. For example, while some analysts seem to have counted all identifiable specimens, others used more selective approaches such as 'POSAC' methods.[220] In a POSAC method, quantification is restricted to a selected suite of the most identifiable and informative anatomical parts. In practice, these elements are likely to dominate most assemblages whether or not a POSAC method is explicitly adopted.

[220] 'POSAC' = Parts Of Skeleton Always Counted. See, *e.g.* Higbee in Lucy *et al.* 2009 p.281, following Davis 1992.

5.2.3 Mandibular ageing data

Mandibular ageing data were encountered in a variety of forms in the available reports, most of which could be standardized using the concordance tables set out in Chapter 3.[221] Standardized ageing data were recorded for 53 mandibular assemblages, representing 49 sites in the study regions. Noddle employs a more idiosyncratic method of ageing which combines both dentition and epiphyseal fusion, and which therefore could not be standardized using this project's concordance system, but whose results are considered in the course of discussion below.[222]

The majority of assemblages contain fewer than 30 aged mandibles per taxon, and are therefore deemed too small to admit meaningful statistical analysis (Table 5.2). Hence, analysis of mortality profiles is restricted to seven assemblages for cattle, 17 for ovicaprids, and seven for pigs, representing a total of 18 sites, widely – if sparsely – distributed across the study regions (Figure 5.2, Table 5.3).

Table 5.2 – Sizes of mandibular assemblages, divided by taxon.

MNI mandibles	cattle	ovicaprid	pigs
<30	34	30	22
30-100	5	13	4
101-200	1	2	1
201-500	1	1	2
>500		1	

The chronological distribution of these mandibular assemblages is far from even. Data are particularly restricted for the Early Saxon period: assemblages of 5th-6th century date with ≥30 mandibles are available only from Barton Court Farm and Barrow Hills, besides the assemblages from West Stow and Bloodmoor Hill, whose main phases of activity fall mainly between the 5th-7th

[221] See above, §3.7.2.
[222] *E.g.* Noddle in Wade-Martins 1980 p.385.

centuries but extend into the early 8th century. The remaining assemblages derive largely from 7th-9th century phases, where datable (Table 5.3).

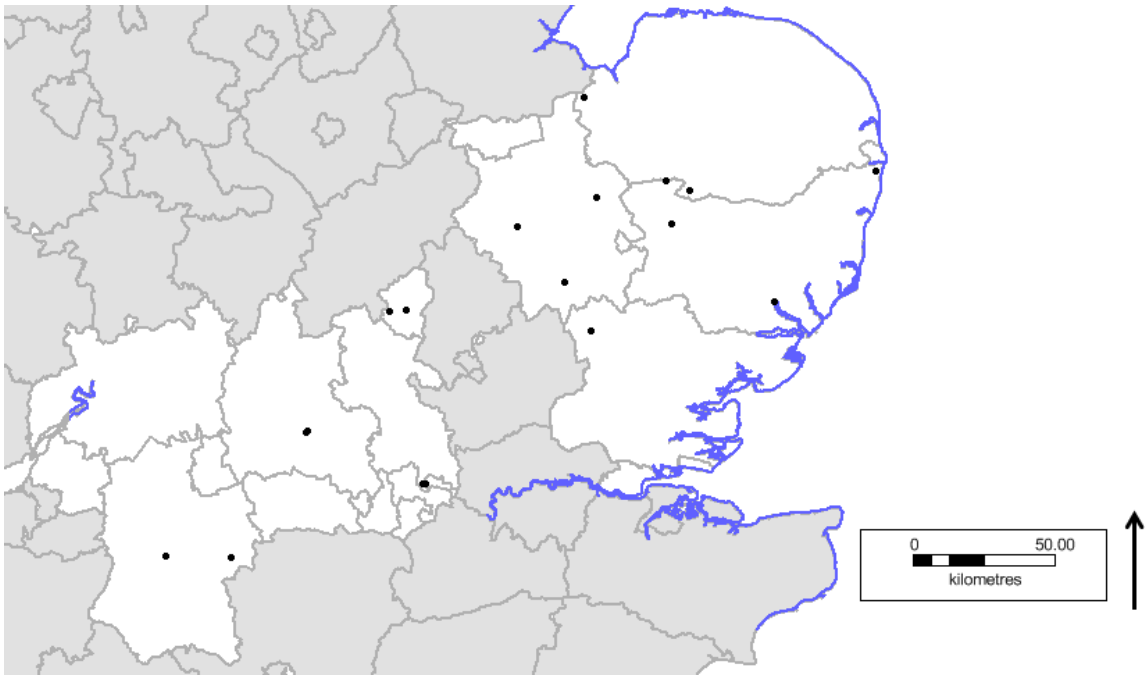


Figure 5.2 – Map of sites with mandibular ageing data, ≥30 mandibles per taxon (Digital Mapping Data © Collins Bartholomew 1995).

As with relative taxonomic abundance data, however, mandibular assemblages are not always subdivided chronologically in available reports. For example, although the published NISP data for Wolverton Turn are presented separately for the Early and Mid Saxon periods, the mandibular ageing data for this site are presented for the Early and Mid Saxon periods together as a whole.[223] In addition, there is one case in which published ageing data are not subdivided by site. At Dorney, although the mandibular data for pigs are published as two separate assemblages for Lake End Road and Lot's Hole respectively, for cattle and ovicaprids there are only composite assemblages representing both sites together, listed here simply as 'Dorney'. The majority of mandibles for both taxa, however, are said to derive from Lake End Road.[224]

[223] Sykes in Preston 2007 p.105.
[224] Powell & Clark in Foreman *et al.* 2002 (CD-ROM).

Table 5.3 – Selected mandibular ageing data (≥30 aged individuals).

species	site	chronology	total	% mandibles				
				Juvenile	Immature	Subadult	Adult	Elderly
cattle	Bloodmoor Hill	C6-7/8	69		15.9	17.4	44.9	21.7
	Brandon	C7-9	83	1.2	2.4	15.7	63.9	16.9
	Dorney	C8-9	128	7.8	12.5	28.9	41.4	9.4
	Godmanchester	C7±	100		27.0	27.0	19.0	27.0
	Ipswich	C7-9	34		14.7	26.5	50.0	8.8
	Pennyland	C6-8	34	17.6	17.6	44.1	20.6	
	West Stow	C5-7/8	290	13.8	17.9	23.4	9.7	35.2
	Wicken Bonhunt	C8-9	99	1.0	3.0	9.1	58.6	28.3
ovicaprid	Barrow Hills	C5-6/7	71	11.3	15.5	19.7	53.5	
	Barton Court Farm	C5-6	65	6.2	23.1	30.8	38.5	1.5
	Bloodmoor Hill	C6-7/8	38			7.9	86.8	5.3
	Brandon	C7-9	410	3.7	7.6	12.7	73.9	2.2
	Consortium Site	C8-9	56	5.4	5.4	7.1	76.8	5.4
	Dorney	C8-9	85	1.2	18.8	18.8	55.3	5.9
	Godmanchester	C7±	70	7.1	5.7	27.1	15.7	44.3
	Harston Mill	C5-9	100	6.0	23.0	21.0	23.0	27.0
	Ipswich	C7-9	117	5.1	35.9	10.3	48.7	
	Market Lavington	C7±	40	17.5	20.0	17.5	45.0	
	Pennyland	C6-8	92	4.0	32.6	24.6	38.8	
	Redcastle Furze	C8-9	44	6.8	27.3	27.3	38.6	
	Walpole St Andrew	C8-9	40		20.0	30.0	50.0	
	West Stow	C5-7/8	1293	6.1	38.5	18.0	36.1	1.2
	Wicken Bonhunt	C8-9	108	9.3	8.3	4.6	76.9	0.9
	Wolverton Turn	C8-9 (mostly)	45	6.7	8.9	33.3	48.9	2.2
pig	Barrow Hills	C5-6/7	41	9.8	17.1	12.2	61.0	
	Bloodmoor Hill	C6-7/8	61	1.6	9.8	36.1	52.5	
	Brandon	C7-9	96	5.2	38.5	13.5	40.6	2.1
	Godmanchester	C7±	100			50.0	50.0	
	Ipswich	C7-9	82	7.3	32.9	20.7	36.6	2.4
	Lake End Road	C8-9	130	4.6	28.5	31.5	33.8	1.5
	West Stow	C5-7/8	315	13.0	23.5	32.1	31.4	
	Wicken Bonhunt	C8-9	313	2.2	16.6	24.9	46.6	9.6

5.2.4 Sexing data

The zooarchaeological sexing data, recorded for 26 assemblages, exhibit such great methodological variation that a comprehensive comparative analysis is beyond the scope of this study (Table 5.4).

Table 5.4 – Occurrence of sexed assemblages by taxon and anatomical element.

sexed element(s)	no. assemblages		
	cattle	ovicaprid	pig
horn-core	2	5	
long-bone osteometry	5	2	
pelvis	8	9	
horn-core + pelvis	1		
canines			18

The numbers of sexed individuals in each assemblage are mostly too small to admit statistical analysis. Ratios for the few assemblages with ≥20 sexed and quantified individuals, here considered most useful for comparative analysis, are detailed in Table 5.5. Where fully quantified results could not be obtained – *e.g.* for qualitative observations of sexual dimorphism in long-bone osteometry – results are considered in the course of discussion below.[225]

Table 5.5 – Sexing data (where sexed individuals ≥20).

taxon	element	site	male	female
cattle	pelves	Lake End Road	2	28
ovicaprid	pelves	Lake End Road	6	15
	horn-cores	North Elmham Park	17	13
		Ramsbury	17	5
		Godmanchester	9	29
	horn-cores + pelves	Brandon	309	212
pig	canines	Bloodmoor Hill	20	38
		Wicken Bonhunt (8th-9th c.)	817	510
		Eynsham (8th c.)	15	6
		Lake End Road	46	48

[225] See below, §5.4.

5.2.5 Pathological data

Pathological data of agricultural relevance were difficult to record systematically, because of a lack of standardized methodology or terminology in available reports. Consequently, the dataset is very small and cannot be considered a representative sample of the study regions; it simply represents those instances which were highlighted in specialist reports, or which were identified by the author as being comparable to the latter cases. It is therefore considered that quantitative analysis is not appropriate, and that it is sufficient here simply to record the occurrences of these possible pathologies, which are drawn upon again in the discussions which follow. The evidence falls into three categories: traction pathologies on cattle long bones, 'penning elbow' on ovicaprid long bones, and a fracture on a pig tibia, possibly a result of tethering (Table 5.6).

Traction pathologies are arthritic changes to cattle long bones that, while sometimes occurring simply because of old age, can be symptomatic of heavy labour, *i.e.* the use of cattle as beasts of burden to pull ards, ploughs, or carts. While a quantified method has been devised which can more reliably identify true traction pathologies, this has yet to be applied systematically to Anglo-Saxon assemblages.[226] The recorded instances in the dataset are variously described as exostosis, eburnation, splaying, and lipping of metapodia and phalanges; fusion of articulating bones; and generic wear on joints.

The term 'penning elbow' denotes lipping or exostosis of sheep humeri and radii, which can be caused by 'rough handling or confinement or penning'. As with traction pathologies, however, this interpretation should be considered provisional; the condition may also be age-related.[227]

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[226] Bartosiewicz *et al.* 1993; 1997.
[227] Poole in Davies 2008 p.178; Dobney *et al.* 2007 pp.184–186.

Table 5.6 – Occurrence of selected animal pathologies in the faunal dataset.

assemblages	cattle: possible traction pathology	ovicaprid: 'penning elbow'	pig: possible tethering fracture
Barrow Hills	X		
Bloodmoor Hill	X		
Sedgeford		X	
Cresswell Field	X		
Sutton Courtenay	X		
Duxford	X		
Gamlingay	X		
Godmanchester		X	
Harston Mill	X		
Lake End Road	X		
Market Lavington	X	X	
Orton Hall Farm	X		
Littlemore	X		
Pennyland		X	
RAF Lakenheath	X		
Walpole St Andrew	X		
Walton Lodge		X	
West Stow	X		X
Wicken Bonhunt	X		
Yarnton (unphased)	X		

5.3 Livestock composition: the ascendancy of sheep?

It has long been suspected that sheep husbandry – especially for wool production – was a particularly important facet of Anglo-Saxon pastoralism.[228] Circumstantial evidence for the high significance of sheep and their wool has variously been sought in the ubiquity of sheep-derived Old English place-names such as Shepton; charter references to large tracts of sheep walk; incidental documentary references, such as Charlemagne's letter to Offa implying the export of Mercian textiles to Francia in the late 8th century; and concentrations of coin finds near regions such as the Cotswolds, well-suited to supporting wool flocks (as in the later medieval period).[229]

Zooarchaeological support for this model, demonstrating a general increase in the proportion of sheep bones (relative to cattle and pig) in faunal assemblages through the 5th-11th centuries, has been repeatedly cited since at least 1978, with many variations in the dates, locations, and socio-economic circumstances to which the ascendancy of sheep has been attributed.[230] Two different – though not necessarily contradictory – schools of thought can be identified in recent literature. The first, associated in particular with the work of Crabtree, posits that the importance of sheep husbandry increased from the 7th century onwards, especially in eastern England.[231] The second, maintained by Sykes, argues that sheep were of secondary importance until the Norman Conquest, except at certain 'precocious' sites of 5th-9th century date in Oxfordshire and Buckinghamshire. Otherwise, cattle retained primary importance in this period, especially as plough-beasts.[232] The question of where, when and how much sheep increased in importance in Anglo-Saxon animal husbandry is central to this chapter. It will be

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[228] *E.g.* Clutton-Brock 1976 p.380.
[229] Ryder 1964 p.6; Finberg 1957 pp.12–14; Maddicott 2002 pp.54–57; Metcalf 1977 p.90; 2003 p.43.
[230] King 1978 p.226; Bourdillon & Coy 1980; Maltby 1981 p.175; Crabtree 1996b p.103; Payne 1999 p.39.
[231] Crabtree 2012 pp.57–59; Hamerow 2012 p.156; O'Connor 2011 p.367.
[232] Sykes 2006 pp.57–58; 2007 p.29; Sykes in Preston 2007 p.108.

addressed in this section, before the more complicated issue of specialized herd/flock management is considered in the following section.

The relative abundance of cattle, ovicaprid and pig bones in the zooarchaeological record is widely used as a proxy for the relative economic and/or dietary importance of the three domesticates in past agricultural regimes. It provides the most direct means of addressing the question of the ascendancy (or otherwise) of sheep in Mid Saxon England. Nonetheless, it must be stressed that relative taxonomic abundance is *not* a direct measure of livestock composition in antiquity: too many taphonomic steps lie between the living herds and their osteoarchaeological remains for this to be the case. The disjunction between the original Anglo-Saxon livestock and the recovered faunal deposits is compounded by factors such as partial excavation, time-slicing,[233] and time-averaging.[234] For these reasons, it would be unwise to attach great significance to NISP ratios unless one of the following criteria is met:

(i) An assemblage is so heavily dominated by a single taxon, relative to prevailing patterns, that a genuine increase in that taxon's importance seems to be the most likely explanation, especially in very large assemblages which are more likely to be representative of original deposited populations.

(ii) Relatively high proportions of a given taxon are consistently exhibited by assemblages of the same period or region, such that a regional or chronological trend towards that taxon's greater importance may plausibly be discerned – allowing for occasional anomalies due to accidents of preservation and/or recovery.

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[233] Where an assemblage represents such a narrow window of events – *e.g.* a single cull or feast – that more general patterns in livestock composition are not represented.

[234] Where an assemblage represents the accumulated debris of several generations, such that chronological changes in livestock composition over that period are averaged out.

The NISP ratios for the 62 selected assemblages are displayed graphically in Figure 5.3; where identifiable, ovicaprid bones are nearly always dominated by sheep, rather than goats.[235] It can be observed that the majority of assemblages fall within a core cluster (shaded area) in which no single taxon is overwhelmingly predominant. The proportions of cattle tend to fall between 30-60%, ovicaprids 20-50%, and pigs 0-30%. This general distribution accords with the expected bias in NISP ratios towards larger taxa such as cattle, which are likely to be represented by more identifiable bones/fragments;[236] and the long-recognized phenomenon whereby pigs are relatively poorly represented in Anglo-Saxon faunal assemblages, in apparent contradiction to documentary references to large herds of swine and the desirability of pigs in food rents.[237] Conversely, none of these assemblages is utterly devoid of any of the three domesticates, and the overall impression is of a mixed pastoral economy in which all three taxa were exploited across the study regions in the 5th-9th centuries.[238]

[235] *E.g.* Crabtree 1989 p.6; Baxter in Gibson 2003a p.192; O'Connor 2011 p.364.
[236] O'Connor 2011 p.364; Sykes 2007 p.28.
[237] Banham 2004 pp.59–60; Hagen 2006 pp.105–123; Clutton-Brock 1976 p.378; Hamerow 2012 p.160.
[238] Thus also O'Connor 2011 p.367.

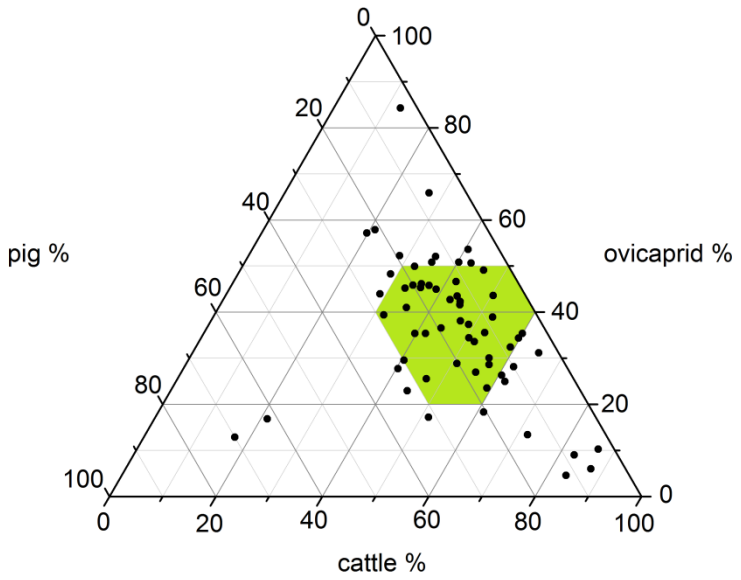


Figure 5.3 – Triplot of NISP data for selected assemblages, where total NISP ≥300 (n=62).[239]

A few assemblages, however, are conspicuous for their relatively high proportions of one particular taxon, thus meeting the first criterion outlined above (Figure 5.4). The two successive assemblages from Wicken Bonhunt (of 6th-7th and 8th-9th century date, respectively) are well-known exceptions to the prevailing low proportions of pig bones in Anglo-Saxon zooarchaeology. Pig is the dominant taxon by NISP in both of these assemblages, a dominance which seems to be unparalleled at other 5th-9th century sites in southern Britain, except for St Albans Abbey (Herts).[240] The pig bones from Wicken Bonhunt are also unusual in their anatomical distribution: skulls, jaws and teeth far outnumber post-cranial elements. The most economical explanation for this pattern is, as Crabtree argues, that the settlement was engaged in specialist pork production, and that the principal, post-cranial meat-bearing bones had been exported to other sites.[241]

[239] For guidance as to how to read a NISP triplot, see above, §3.7.1.
[240] Crabtree 2012 pp.14–15.
[241] Crabtree 2012 pp.16–17, 26–27.

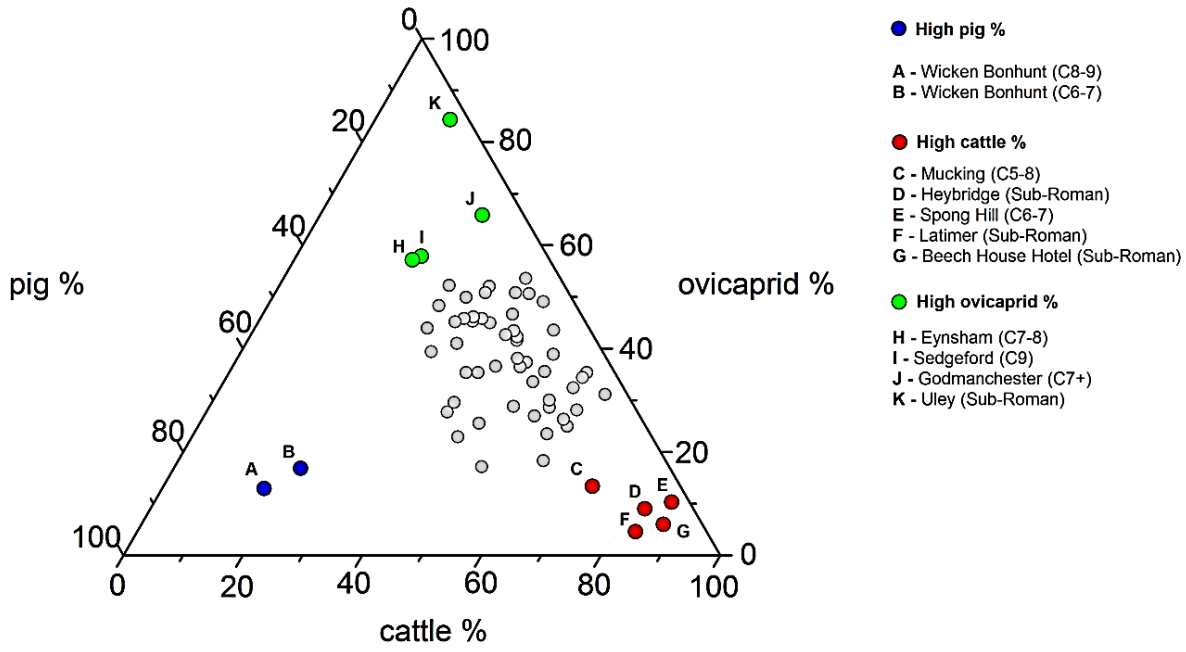


Figure 5.4 – Triplot highlighting assemblages with notably high proportions of cattle, ovicaprids, or pigs.

It may be that, as Crabtree suggests, the Essex/East Anglian clays of Wicken Bonhunt's hinterland were relatively heavily wooded in the 5th-9th centuries and thus provided ample pannage for large-scale pig husbandry, consistent with the faunal remains.[242] However, it is not possible on current evidence to compare the Wicken Bonhunt assemblages with other contemporary faunal remains from the same region. Apart from the sparse evidence from Stansted, which produced no faunal data, there is a dearth of comparative Anglo-Saxon settlement evidence in the immediate hinterland of Wicken Bonhunt, on the chalk dipslope and clay plateau of north-west Essex. Nonetheless, it is interesting to note that St Albans Abbey, although lying at some remove from Wicken Bonhunt, occupies a somewhat similar geological situation, between chalk uplands and London Clay (Figure 5.5).

[242] Crabtree 2012 p.58; 1989 p.28.

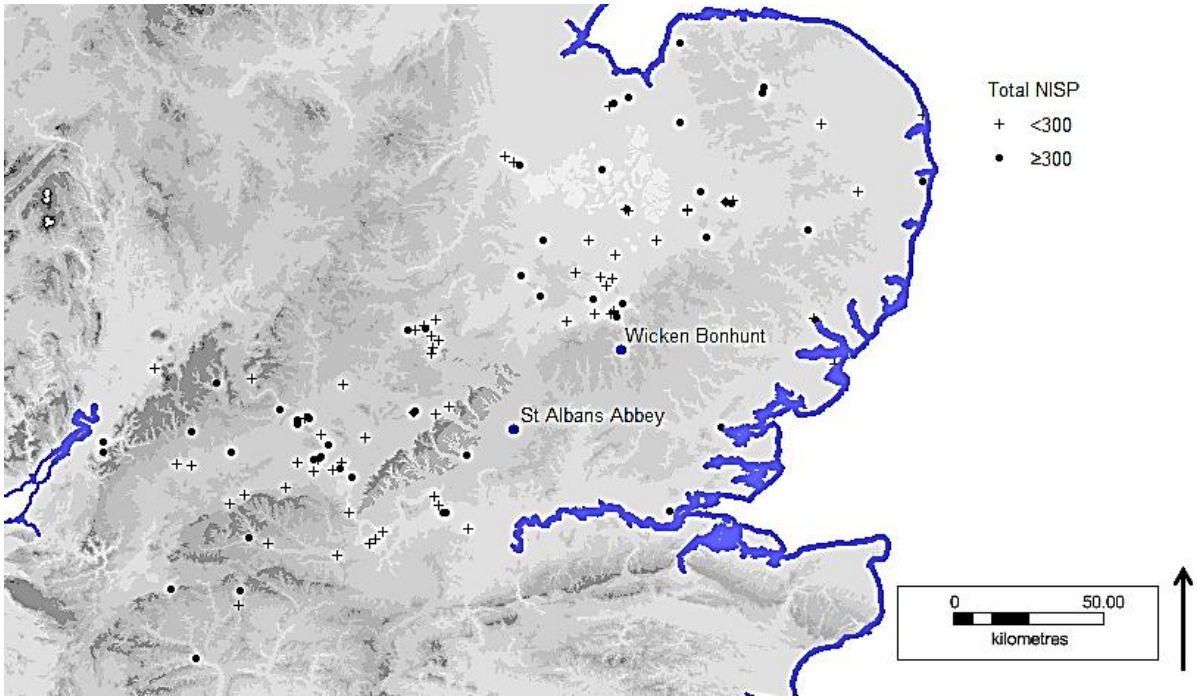


Figure 5.5 – Locations of Wicken Bonhunt and St Albans Abbey in relation to other faunal assemblages in the dataset (Digital Mapping Data © Collins Bartholomew 1995).

Five assemblages are noted for their relatively high proportions of cattle bones (above, Figure 5.4). Three of these represent 'Sub-Roman' phases at Romano-British sites, *i.e.* of probable 5th century or later date.[243] The Heybridge and Beech House Hotel sites represent Romano-British small towns, while Latimer is a villa site; all are situated in river valleys. In all three cases, the high proportions of cattle in the 'Sub-Roman' assemblages have strong precedents in the Romano-British phases from the same sites, suggesting the continuation of Roman-period livestock composition (and/or mobilisation) into at least the 5th century at these sites.[244] In these instances, perhaps, one could posit a continuing association between lowland valley pastures and cattle husbandry, as identified by Hesse in the Thames valley for the Roman period.[245]

By contrast, the relatively high proportions of cattle bones in Early Saxon assemblages from Mucking (71.9% of 2,116) and Spong Hill (86.7% of 731) appear more anomalous among

[243] For dating methodology and terminology, see above, §3.5.
[244] Grant in Rowley & Brown 1981 p.52; Johnstone & Albarella 2002 p.13; Hamilton in Branigan 1971 pp.164–165.
[245] Hesse 2011 pp.230–234.

contemporary 5th-7th century assemblages. However, at Spong Hill there is a precedent for the predominance of cattle in the site's Late Roman phase. Cattle also still dominate the Early Saxon assemblage by MNI (68.3% of 63), such that fragmentation biases alone cannot account for the dominance of cattle. Moreover, cattle bones appear to dominate the identifiable bones from each individual SFB and pit at the site, such that the overall percentages have not been skewed by a small number of atypical deposits.[246]

At Mucking, zooarchaeological data for Romano-British phases were unavailable at the time of writing, so that local precedents for the dominance of cattle are unknown. The recorded NISP data for cattle, ovicaprid and pigs at Mucking represent deposits from 134 SFBs, most of which are individually dominated by cattle bones. Considering only those five SFBs with >100 specimens of the three common domesticates, four are dominated by cattle and one by pig (Table 5.7). As with Spong Hill, therefore, the apparent dominance of cattle bones at Mucking does not seem to be due to the biasing effects of a few atypical deposits.

Table 5.7 – NISP ratios from SFBs at Mucking (≥100 specimens).

feature	cattle%	ovicaprid%	pig%	total
GH57	63.8	17.1	19.0	105
GH149	73.9	8.1	18.0	111
GH58	55.3	25.0	19.7	132
GH17	69.6	12.6	17.8	135
GH33	31.3	20.0	48.7	150

It can be argued, therefore, that livestock composition was genuinely cattle-dominated at Spong Hill and Mucking, unusually so for Anglo-Saxon settlements of the 5th-7th/early 8th centuries. Yet there are no contemporary settlements in the immediate vicinity of either Mucking or Spong Hill with which to make intra-regional comparisons. It therefore remains possible that, within their respective regions, the dominance of cattle at these sites was not unusual for the period. Indeed, the five 'cattle-rich' assemblages overall exhibit a slight distributional bias

[246] Bond in Rickett 1995 pp.142–143.

towards the south and east of the study regions, with a particular focus on river valley locations (Figure 5.6). However, it should be noted that the excavation reports stress the acidity of the soils at both Mucking and Spong Hill. This acidity, having adversely affected the preservation of bone, could have resulted in a bias towards larger-boned taxa, *i.e.* in this case, cattle.[247]

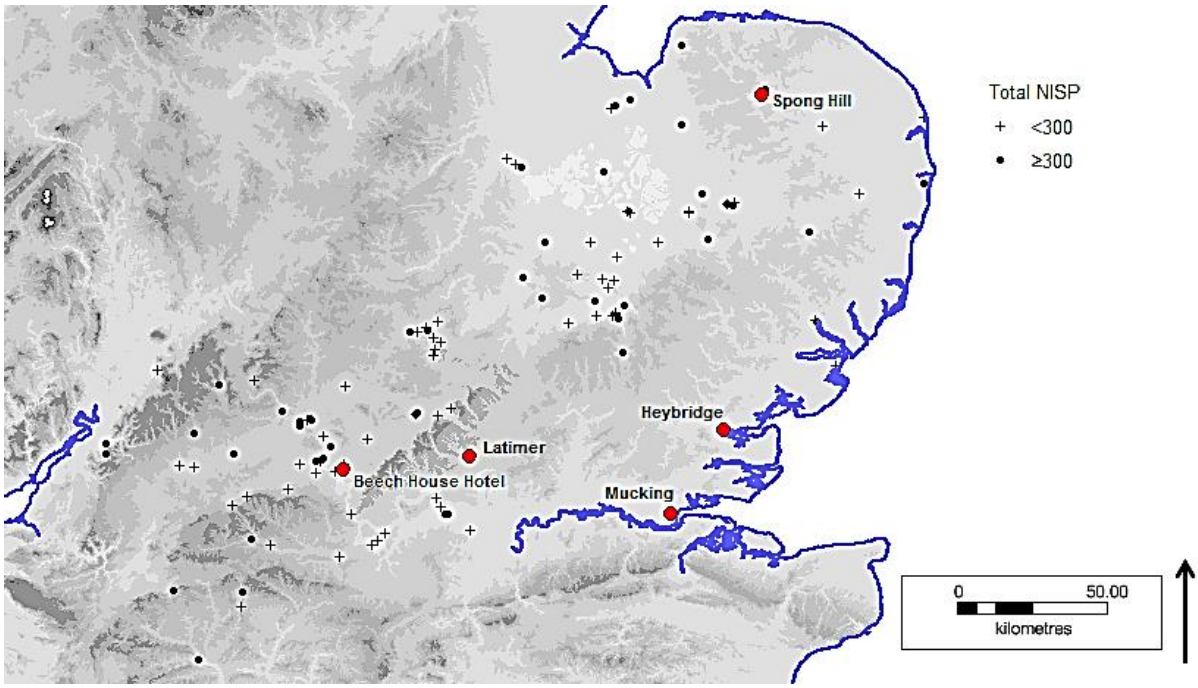


Figure 5.6 – Locations of cattle-rich assemblages in relation to other faunal assemblages in the dataset (Digital Mapping Data © Collins Bartholomew 1995).

Finally, four assemblages are notable for their relatively high proportions of ovicaprid bones (above, Figure 5.4). Of these, the Sub-Roman assemblage from Uley is uniquely rich in ovicaprids (84.3% of 11,163). There is a clear precedent for the pattern at Uley: ovicaprids, including unusually high proportions of goats, are predominant by both NISP and MNI in every phase at this site, spanning Iron Age, Romano-British, and post-Roman periods.[248] A multi-phase sequence of ritual activity is represented, with a Romano-British temple being replaced by basilica and baptistery structures in the 5th-7th centuries, according to the published interpretation. The absolute dates appear to be somewhat conjectural, hence the classification here as 'Sub-

[247] Done in Hamerow 1993 p.74; Rickett 1995 pp.141–142.
[248] Levitan in Woodward & Leach 1993 p.260, Table 11.

Roman'.[249] The earlier assemblages are interpreted as sacrificial deposits: goat, sheep and domestic fowl bones together comprising a series of votive assemblages. For the Sub-Roman assemblages, however, coinciding with the construction of an apparently ecclesiastical complex, the votive interpretation becomes less likely, although it is possible that some of the material represents reworked Romano-British deposits.[250] At the very least, it can be argued that the large size of the Uley assemblages, and the high degree of dominance exhibited in them by ovicaprids, strongly suggests an emphasis on the herding of sheep/goats in the vicinity of the western Cotswolds, persisting over several centuries.[251]

At Godmanchester, ovicaprids dominate the faunal remains (65.9% of 619), most of which derive from an enclosure ditch, where ovicaprids constitute 91.6% of 297 specimens. In the portion of the assemblage which derives from a SFB, however, cattle are marginally dominant (48.7% of 268). It is possible, therefore, that the apparent dominance of ovicaprids at this site is due mainly to the ditch deposit(s), which are not necessarily representative of the site as a whole.[252]

Ovicaprids dominated to a lesser extent in the 7th-8th century assemblage from Eynsham (57.2% of 1,768) and the 9th century assemblage from Sedgeford (57.9% of 615). Ovicaprid dominance recurs to varying degrees throughout all phases at both of these sites, by both NISP and MNI, and the available reports do not indicate any substantial differences between feature types or individual contexts.[253] Another assemblage of presumed Mid Saxon date at Sedgeford,

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[249] Woodward & Leach 1993 p.11 – Phase 7 is here classed as 'Sub-Roman'.
[250] Levitan in Woodward & Leach 1993 p.297.
[251] *Cf.* Hesse 2011 p.229 associates sheep husbandry with the Cotswolds in the Roman period.
[252] Baxter in Gibson 2003a pp.190-197.
[253] Mulville in Hardy *et al.* 2003 p.344, Table 10.1; Poole in Davies 2008 pp.166–167.

from earlier excavations, is also dominated by ovicaprid bones.[254] Hence, a genuine (if slight) tendency towards ovicaprid-richness can be proposed for Eynsham and Sedgeford.

If the apparent predominance of ovicaprids in these four assemblages is accepted – a claim which is perhaps most tenuous with regard to Godmanchester, given the observed differences between the two principal deposits – then it is notable that their geographical distribution tends towards the north and west of the study regions, *i.e.* the approximate inverse of the distribution exhibited by the cattle-rich assemblages (Figure 5.7; *cf*. Figure 5.6).

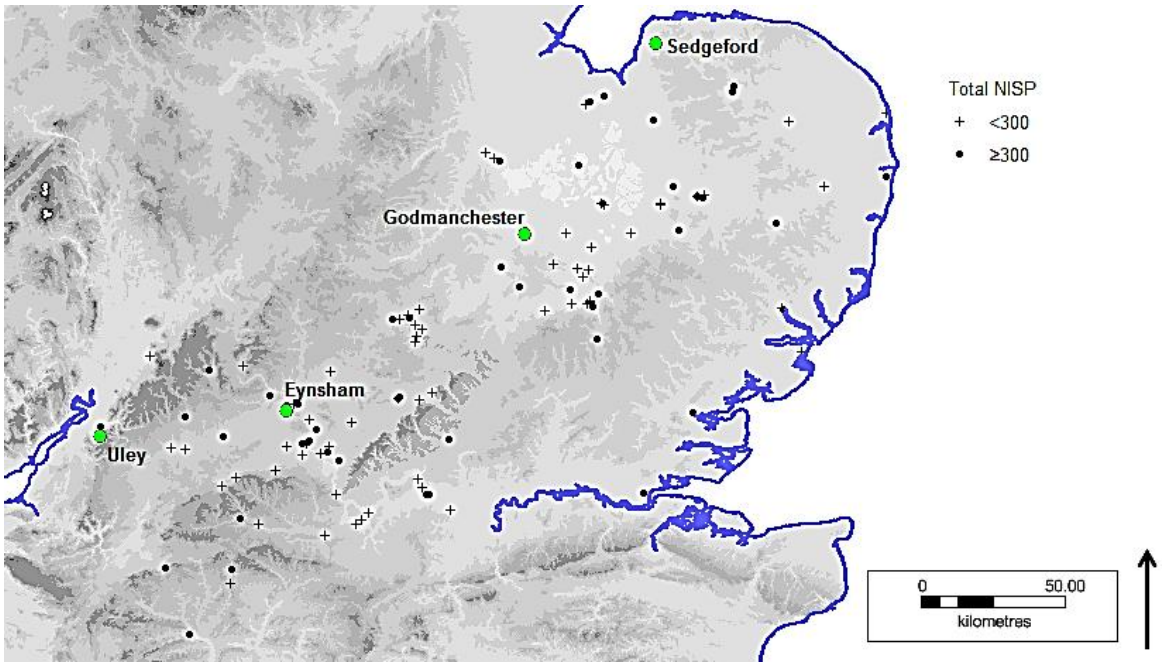


Figure 5.7 – Locations of ovicaprid-rich assemblages in relation to other faunal assemblages in the dataset (Digital Mapping Data © Collins Bartholomew 1995).

The NISP ratios for all of the 62 selected assemblages are displayed cartographically below, as pie charts in Figures 5.8–5.9, and as graduated circles in Figure 5.10 (A-C).[255] In very general terms, these maps appear to reinforce the nascent distribution patterns suggested above: relatively high proportions of cattle (and to a lesser extent pigs) corresponding roughly with a crescent spanning central East Anglia from north to south and the Thames valley from west to

[254] Clutton-Brock 1976 p.377, Fig.9.1. These earlier excavations remain unpublished, and insufficient data could be obtained to warrant inclusion in the project dataset.
[255] *Cf.* Sykes 2007 pp.28–33 for graduated circle method.

east; and relatively high proportions of ovicaprids corresponding roughly with the Cotswolds to the west, and the fens and catchment of the Great Ouse to the east. The assemblages from the Upper Thames valley appear to represent a closer balance between cattle and ovicaprids than other parts of the study regions, perhaps reflecting the diverse range of agricultural environments within relatively close proximity to this area, including floodplains, gravel terraces, and clay vales, as well as chalk/limestone uplands further to the north and south.

Diachronic trends, if any, are yet more subtle. There is a slight tendency for more cattle-rich assemblages to be of Sub-Roman or Early Saxon date, and therefore unlikely to post-date the 7th century (Figure 5.11). Conversely, there is a *very* slight tendency for the more ovicaprid-rich assemblages to be of Intermediate or Mid Saxon date (Figure 5.12), *i.e.* unlikely to pre-date the 7th century – with the notable exception of Sub-Roman Uley, an atypical site as discussed above. Pigs are relatively poorly represented throughout the period. Nonetheless, it may be noted that the most pig-rich assemblages tend to be of Mid Saxon date (later 7th/8th-9th c.), whereas pigs are least well represented in the Sub-Roman assemblages (Figure 5.13). In short, while the data for relative taxonomic abundance in the study regions do not present entirely compelling evidence for a 'boom' in sheep husbandry in the Mid Saxon period, they would at least be consistent with a slight shift in emphasis, occurring from around the 7th century onwards, in favour of sheep husbandry at the expense of cattle, particularly around the East Anglian fens and the catchment of the Great Ouse.

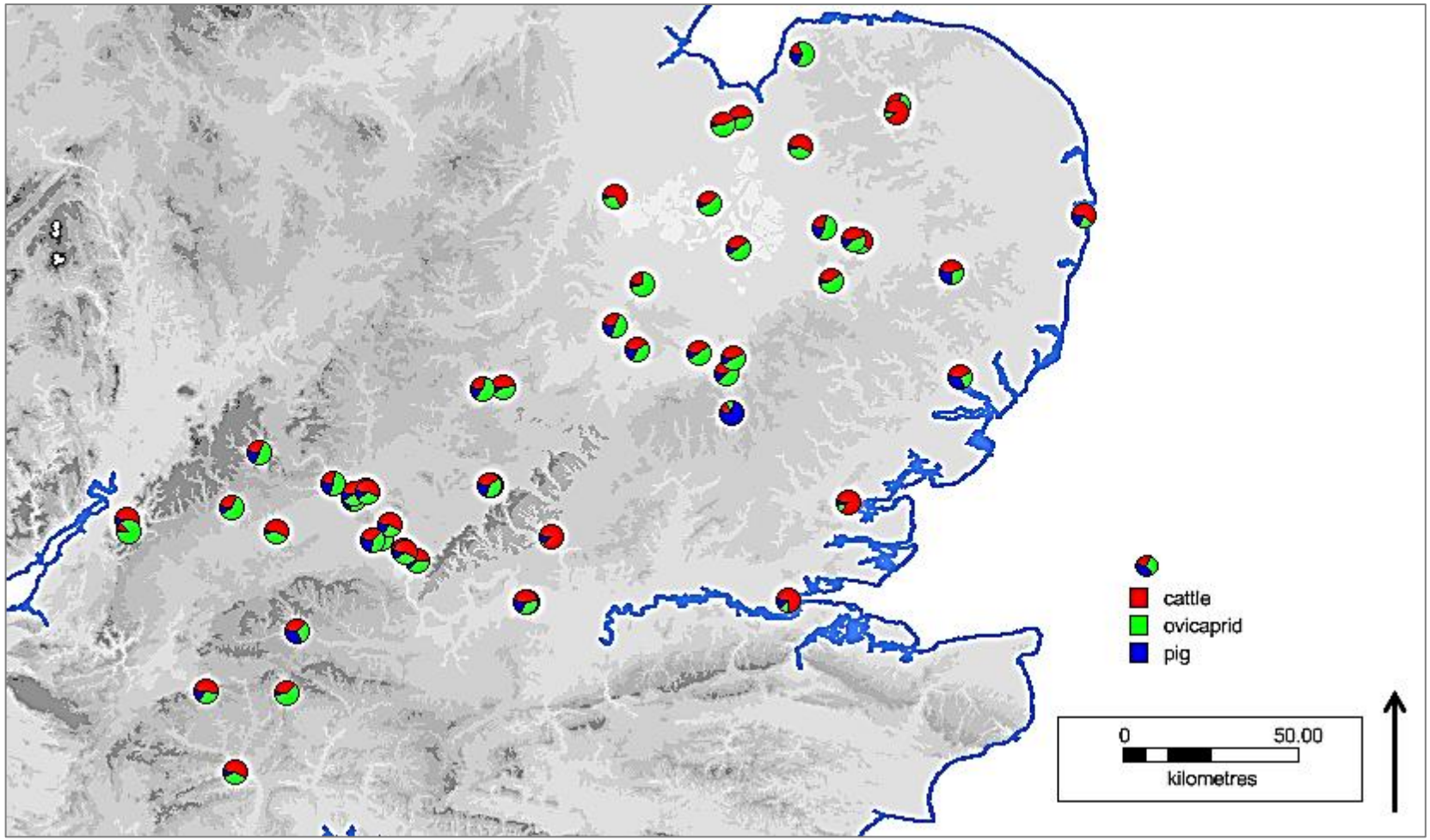


Figure 5.8 – Map of selected faunal assemblages and their taxonomic composition (Digital Mapping Data © Collins Bartholomew 1995).

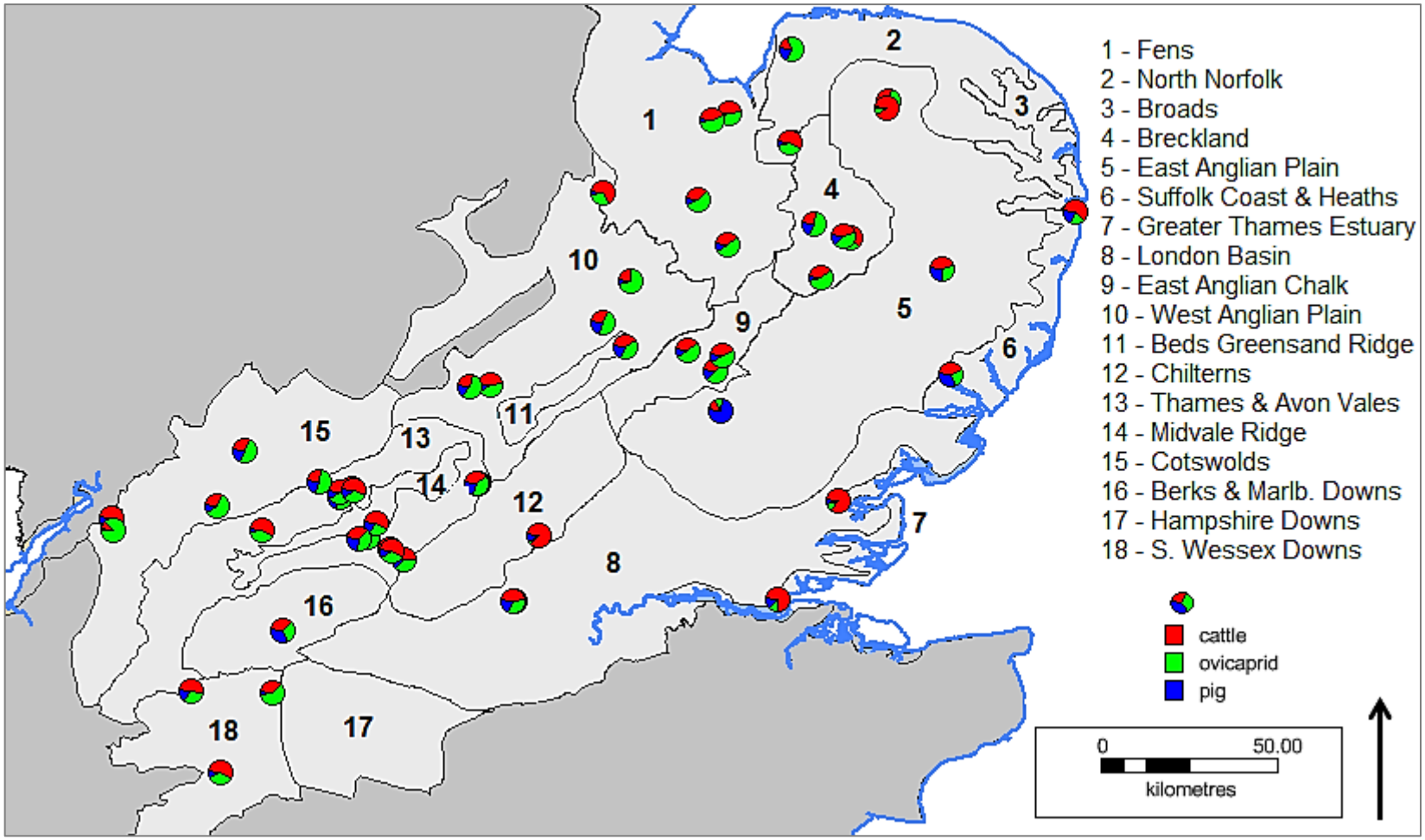


Figure 5.9 – Map of selected faunal assemblages and their taxonomic composition, against Natural Areas (Digital Mapping Data © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right 2013).

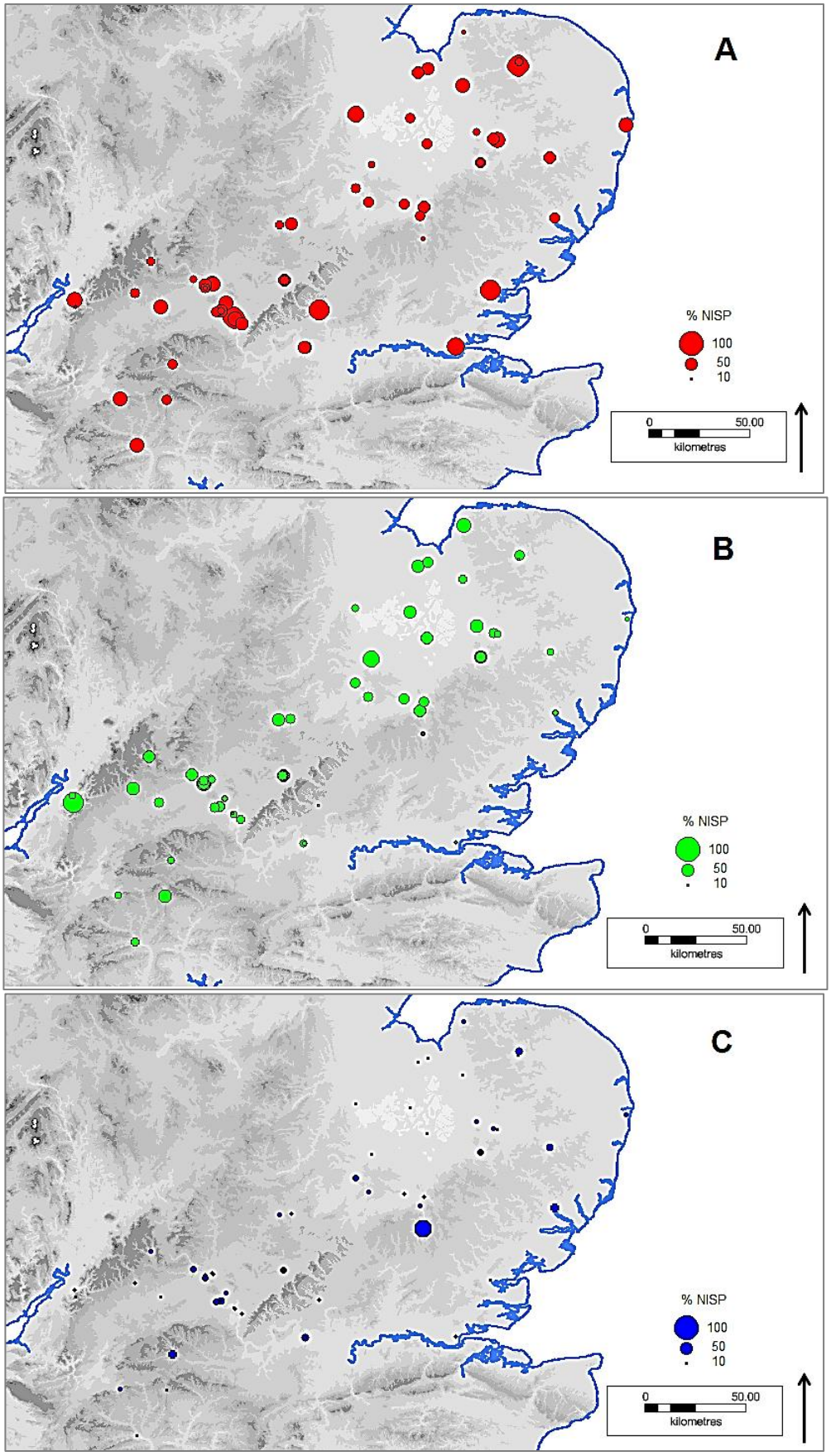


Figure 5.10 – Faunal assemblages in study regions, coded by percentage of (A) cattle, (B) ovicaprid, and (C) pig (Digital Mapping Data © Collins Bartholomew 1995).

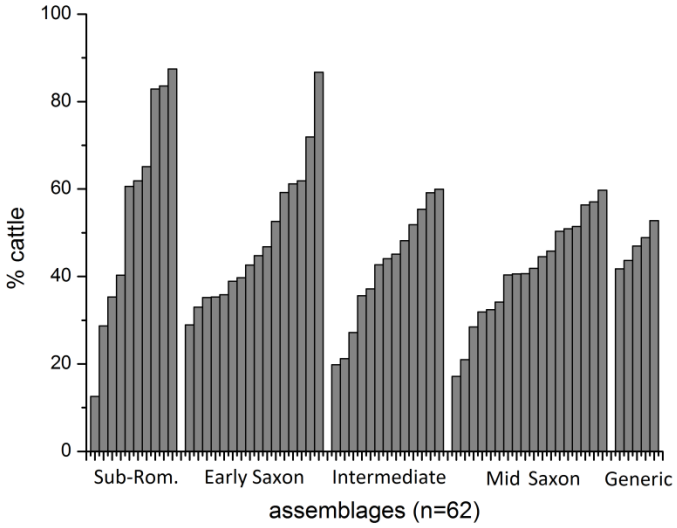


Figure 5.11 – Percentages of cattle bones (NISP) in assemblages over time.

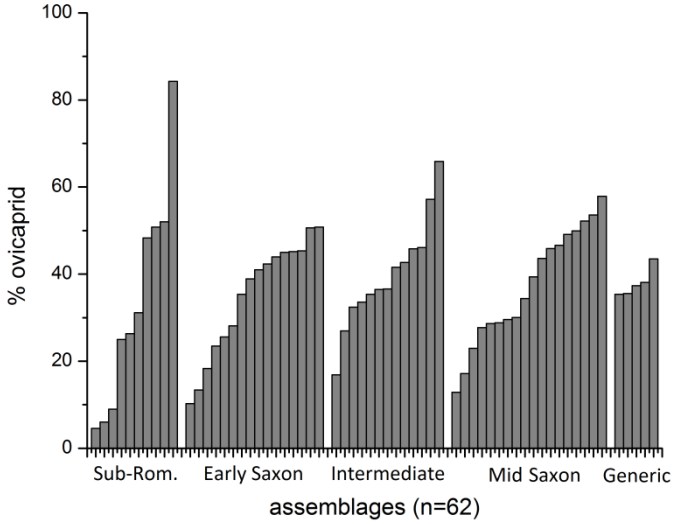


Figure 5.12 – Percentages of ovicaprid bones (NISP) in assemblages over time.

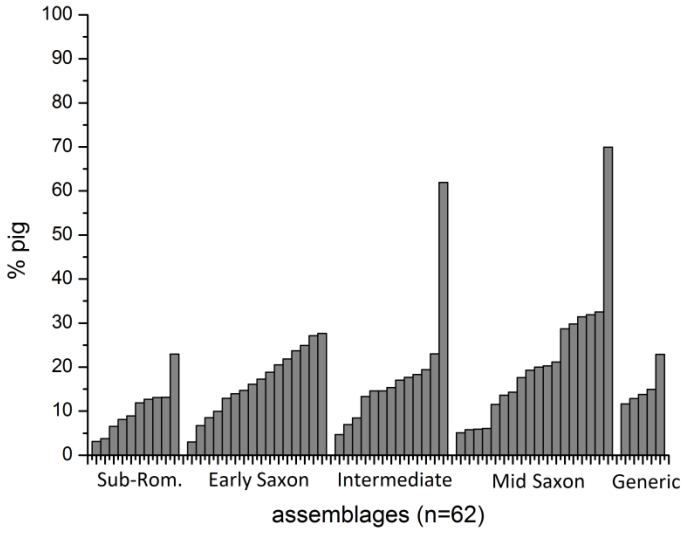


Figure 5.13 – Percentages of pig bones (NISP) in assemblages over time.

5.4 Herd management: specialization?

A more detailed analysis of herd structures, based upon mandibular mortality profiles, sexing data, and pathological abnormalities, is required to shed further light on the exploitation of the three main domesticates. The observations made through these analyses are independent of, and complementary to, those based upon relative taxonomic abundance, and may potentially elucidate specialized management in Mid Saxon animal husbandry.

5.4.1 Cattle

The mandibular mortality profiles of cattle are presented in Figure 5.14. The mortality profile of the West Stow cattle is that of an archetypal 'unstructured' cull, with no overriding bias towards either Subadult individuals slaughtered for prime meat, or Adult/Elderly individuals kept for milk, traction, or manure.[256] Elderly individuals constitute the highest proportion of aged mandibles, but they do not outnumber younger individuals. The Mid Saxon assemblages from Dorney and Ipswich exhibit slight variations on this pattern, with more of an emphasis upon Subadult and Adult individuals, and a predominance of females: perhaps a combination of prime beef cattle and surplus dairying stock supplied to these non-agricultural sites.[257]

The West Stow pattern contrasts most strikingly with those represented at Brandon and Wicken Bonhunt, both of which are Mid Saxon assemblages from presumed estate centres. In these assemblages, the cattle are heavily dominated by Adult and, to a lesser extent, Elderly individuals, indicating a probable focus upon secondary products.[258] Fully quantified sexing data are not available for these cattle, but osteometry suggests a majority of males at Wicken Bonhunt and females at Brandon. The cattle at Wicken Bonhunt also bear traces of possible traction

[256] For terminology and methodology, see above, §3.7.2; Crabtree 1989 pp.74–75.
[257] Crabtree 2012 p.41; Powell and Clark in Foreman *et al.* 2002, CD-ROM.
[258] Crabtree 2012 pp.31–34.

pathologies. The ageing, sexing and pathological data together therefore suggest that dedicated plough oxen are strongly – if circumstantially – represented at Wicken Bonhunt, although it cannot be conclusively demonstrated that the assemblage is specifically dominated by the bones of castrated male cattle.[259] While dairying and/or breeding stock may perhaps account for more of the cattle at Brandon, where females appear to dominate, it should be remembered that cows may equally be used as traction beasts in place of oxen.[260]

Possible traction pathologies are also noted on cattle bones at West Stow, such that plough beasts may be represented in this assemblage too. However, the faunal evidence as a whole is not indicative of specialized ox teams such as may be represented Wicken Bonhunt, *i.e.* there is no corresponding marked emphasis upon Adult individuals. A slightly more compelling case for identifying specialized plough oxen could perhaps be made at Bloodmoor Hill (6^{th}-7^{th}/8^{th} c.), where most aged cattle mandibles are Adult or Elderly, and where two metatarsals display arthritic changes which could be linked to traction work.[261] Such evidence could be considered *consistent* with the keeping of plough teams, but is not conclusive of the fact. In any case, the mere presence of traction beasts (whether oxen or cows) in an assemblage is not of particular significance, since it may be assumed that draught animals would have been required to pull ards, if not heavier ploughs, in most farming communities of the 5^{th}-9^{th} centuries.

A very different pattern is evident at Pennyland, whose relatively high proportion of Subadult individuals plausibly suggests a structured cull intended to obtain prime beef, while retaining some older cattle as breeding stock.[262] The assemblage is not, however, closely dated within the site's 6^{th}-8^{th} century occupation sequence. No other assemblages in the selected dataset display a comparable pattern to that observed at Pennyland. The 'almost unprecedented'

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[259] Crabtree 2012 p.46.
[260] Isaakidou 2006 pp.104–108.
[261] Higbee in Lucy *et al.* 2009 p.293.
[262] Holmes in Williams 1993 p.138.

high proportion of young cattle recorded at Lechlade is from a sample of only 15 mandibles, arguably too few to be considered representative of genuine cull patterns.[263]

To summarize, evidence for specialized cattle management is scarce in the dataset but, where it occurs, there is nothing *necessarily* earlier than the 7th century: the putative plough oxen at Wicken Bonhunt, and the dairying/breeding stock at Brandon, are all of Mid Saxon date; while the beef cattle at Pennyland and the possible plough beasts at Bloodmoor Hill date from somewhere between the 6th to early 8th centuries.

5.4.2 Ovicaprids

The majority of ovicaprid mortality profiles show no clear emphasis upon either primary or secondary products, *i.e.* they are theoretically consistent with a relatively unstructured, unspecialized cull (Figure 5.15). Such is the model suggested by Crabtree for West Stow.[264] Variations upon this basic model are equally applicable to such chronologically and geographically diverse assemblages as those from Redcastle Furze, Pennyland, Harston Mill, and Barton Court Farm, none of which demonstrates clear signs of specialized management.

Evidence for the focused production of mutton or lamb is scarce. There is some indication of an early cull at Collingbourne Ducis, a predominantly Mid Saxon assemblage with a small peak of Immature individuals, aged roughly 6-12 months. As Hamilton-Dyer suggests, this profile seems to imply 'an interest in meat rather than wool'.[265] At Wolverton Turn, whose mandibular ageing data are not sub-phased although the assemblage appears to be predominantly of Mid Saxon

[263] Maltby in Bateman *et al.* 2003 p.74.
[264] Crabtree 1989.
[265] Hamilton-Dyer in Pine 2001 p.106.

date, there is a joint emphasis upon Subadult and Adult individuals, which again could indicate some emphasis upon meat-production beyond that evidenced in most other assemblages.[266]

By contrast, several other assemblages are dominated by Adult individuals and are thus indicative of specialization in secondary products (milk, wool, manure): the clearest examples are from Bloodmoor Hill, Brandon, Ely (Consortium Site), and Wicken Bonhunt. At North Elmham Park, too, Noddle found that mature individuals (*i.e.* approximately over four years old) dominated the ovicaprids.[267] All of these assemblages are of 7th-9th century date except for Bloodmoor Hill, where activity spans the 6th to early 8th centuries, and which the excavators suggest could represent an early form of estate centre.[268]

As Crabtree argues, there are strong reasons for supposing that wool was of particular importance among the secondary products at Brandon: the sheep are dominated by wethers (castrated males), which are thought to produce the best wool; and there is complementary botanical evidence for specialized textile production at the site.[269] By contrast, at Wicken Bonhunt the sheep appear to be mostly female (inferred from sexual dimorphism in osteometry); such a pattern would perhaps be more consistent with dairying/breeding stock. The same may be true of the Godmanchester assemblage, whose ovicaprids are dominated by females and include an unusually high proportion of Elderly individuals. At North Elmham Park ewes and wethers exist in roughly equal proportions, a pattern which perhaps implies the importance of both milk and wool.[270]

The pathological indicator known as 'penning elbow' is recorded in at least five assemblages: from Godmanchester, Sedgeford, Market Lavington, Pennyland, and Walton Lodge.

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[266] Sykes in Preston 2007 p.108.
[267] Noddle in Wade-Martins 1980 p.396. Her data are not directly comparable in format to those presented in Figure 5.15, hence their omission.
[268] Lucy *et al.* 2009 pp.427–434.
[269] Crabtree 2007 pp.164–167; see below, §8.2.3.
[270] Crabtree 2012 p.49; Baxter in Gibson 2003a p.192; Noddle in Wade-Martins 1980 p.396.

Although the condition is not exclusively caused by penning, it may be noted that none of these occurrences is necessarily earlier than the 7th century, *i.e.* they might all be coincident with the proliferation of paddocks and droveways which is evident from the 7th century onwards. Paddocks/droveways and 'penning elbow' coincide, in fact, at both Godmanchester and Pennyland.[271]

To summarize: as with cattle, there is no evidence for specialized sheep husbandry that necessarily predates the 7th century. The tentatively suggested production of prime meat at Collingbourne Ducis and Wolverton Turn is represented primarily by Mid Saxon material; the instances of 'penning elbow' at Godmanchester, Sedgeford, Market Lavington, Pennyland and Walton Lodge are all of probable 7th century or later date, likewise the focus upon secondary products at Brandon, Ely, Wicken Bonhunt, Godmanchester, North Elmham Park, and – in an unusually early instance – Bloodmoor Hill (spanning 6th to early 8th centuries).

5.4.3 Pigs

Few significant patterns in herd management were anticipated from the pig bones, since pigs are only kept for their primary products (meat, fat, hides), besides breeding stock. Nonetheless, variations are possible. For example, as Noddle suggests, 'older pigs might result from extensive husbandry when compared to sty keeping', presumably because the latter approach might better enable swineherds to select porkers for culling immediately upon reaching full weight.[272]

A relatively unstructured mortality profile, with no strong emphasis upon any single age category, characterizes the pigs at Brandon, Ipswich, Lake End Road, and West Stow; there are subtle differences between the assemblages, but the overall pattern is broadly similar for each

[271] See below, §5.5.
[272] Noddle 1975 p.257.

site despite the differences in date, location and status between them (Figure 5.16). Of particular interest is the appearance of some very young pigs (including neonates) at Dorney and Ipswich, which is arguably suggestive of local rearing, despite the supposedly non-agricultural nature of these sites (a putative rural market and specialist craft/trading settlement, respectively).[273]

More mature profiles are exhibited by the pig mandibles at Wicken Bonhunt and, more clearly, at Barrow Hills and Bloodmoor Hill, thus contrasting with the profiles from Brandon and West Stow. This difference does not, therefore, correspond with either status or chronology, since the two putative Mid Saxon estate centres (Brandon and Wicken Bonhunt) are mutually dissimilar, as are the 'ordinary' Early Saxon settlements (Barrow Hills and West Stow). Rather, the pattern seems to correspond better with geological situation: Brandon and West Stow lie in the sandy Breckland region, whereas Wicken Bonhunt, Barrow Hills and Bloodmoor Hill all have closer access to clayey areas.[274] Crabtree contends that, while the Breckland is not a good environment for pig rearing, better woodland pannage could well have been supported on clays.[275] Following Noddle's suggested interpretation of pig mortality profiles (cited above), it could therefore be conjectured that 'extensive husbandry' was practiced in the clayey areas whereas, in the Breckland, a comparative lack of good pannage may have encouraged localized sty husbandry instead.

The model is highly speculative, but would at least be consistent with the sole recorded pathological indicator of relevance to pig husbandry: a single fractured tibia at West Stow which Crabtree suggests could have resulted from the pig having strained against its tether. Clusters of coprolites in the fills of SFBs have also been interpreted as possible evidence for tethering or sty

[273] Crabtree 2012 p.31; Powell & Clark in Foreman *et al.* 2002 (CD-ROM).
[274] Respectively: clays of the East Anglian Plain, Thames clay vales, and a clay ridge near the Suffolk coast.
[275] Crabtree 1989 p.13.

husbandry at West Stow.[276] At Bloodmoor Hill, on the other hand, the 'extensive husbandry' conjectured above would arguably be consistent with the stable isotope results from pig bones at that site: values were found to be closely similar to those from herbivores, a pattern which arguably tells against domestic rearing with a diet enriched by scraps.[277]

[276] Crabtree 1989 p.28.
[277] O'Connell & Lawler in Lucy *et al.* 2009 p.318.

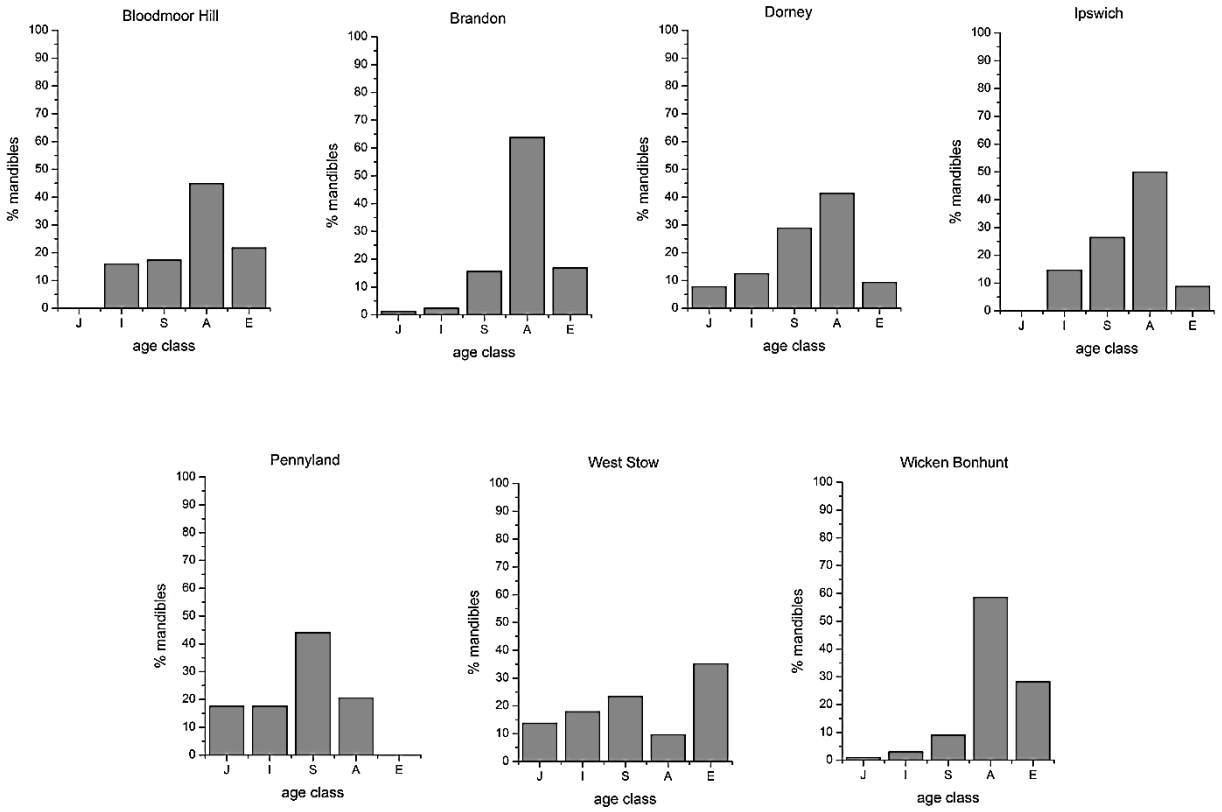


Figure 5.14 – Mandibular mortality profiles for cattle (assemblages with ≥30 aged individuals).

(J = Juvenile, I = Immature, S = Subadult, A = Adult, E = Elderly)

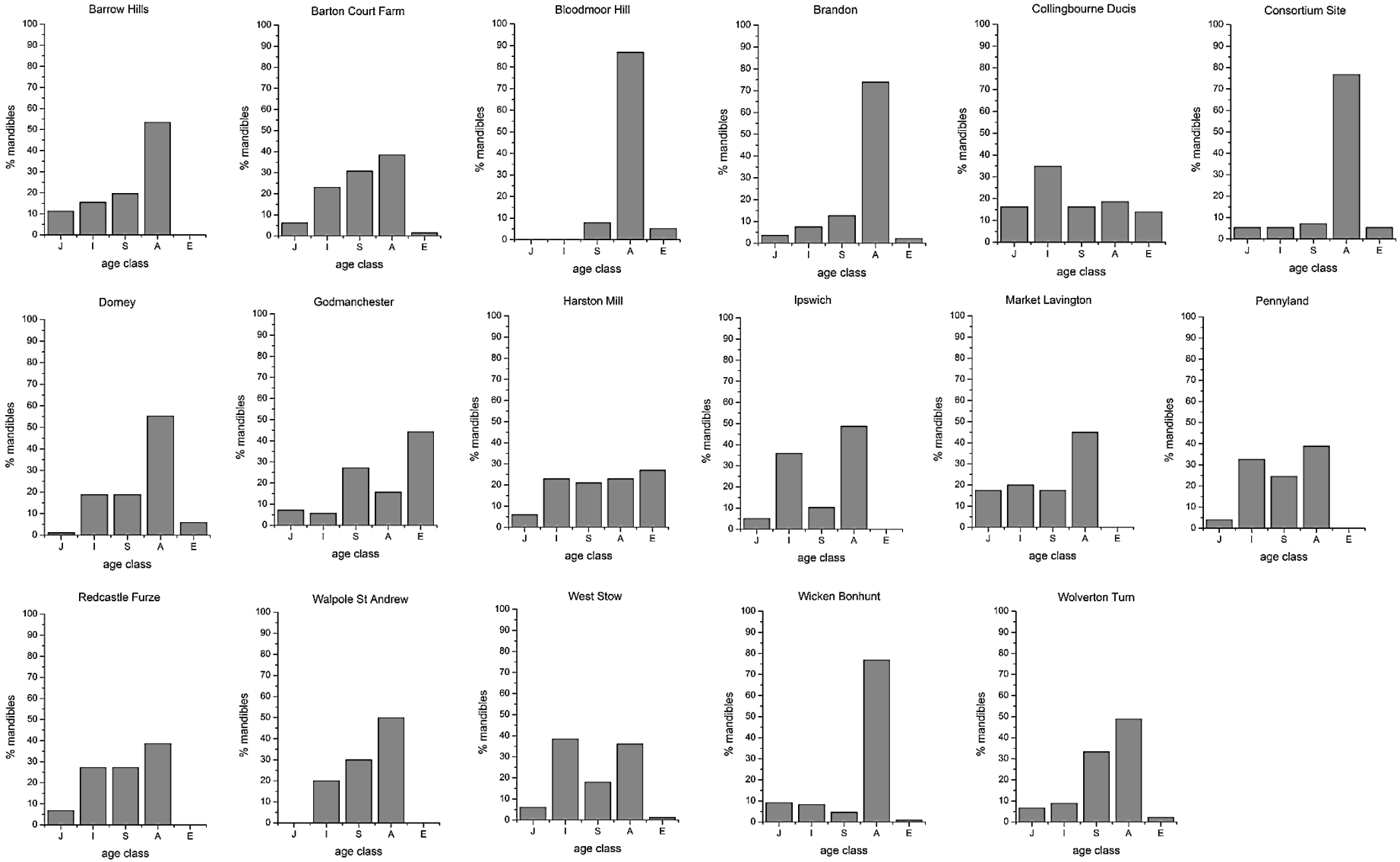


Figure 5.15 – Mandibular mortality profiles for ovicaprids (assemblages with ≥30 aged individuals).

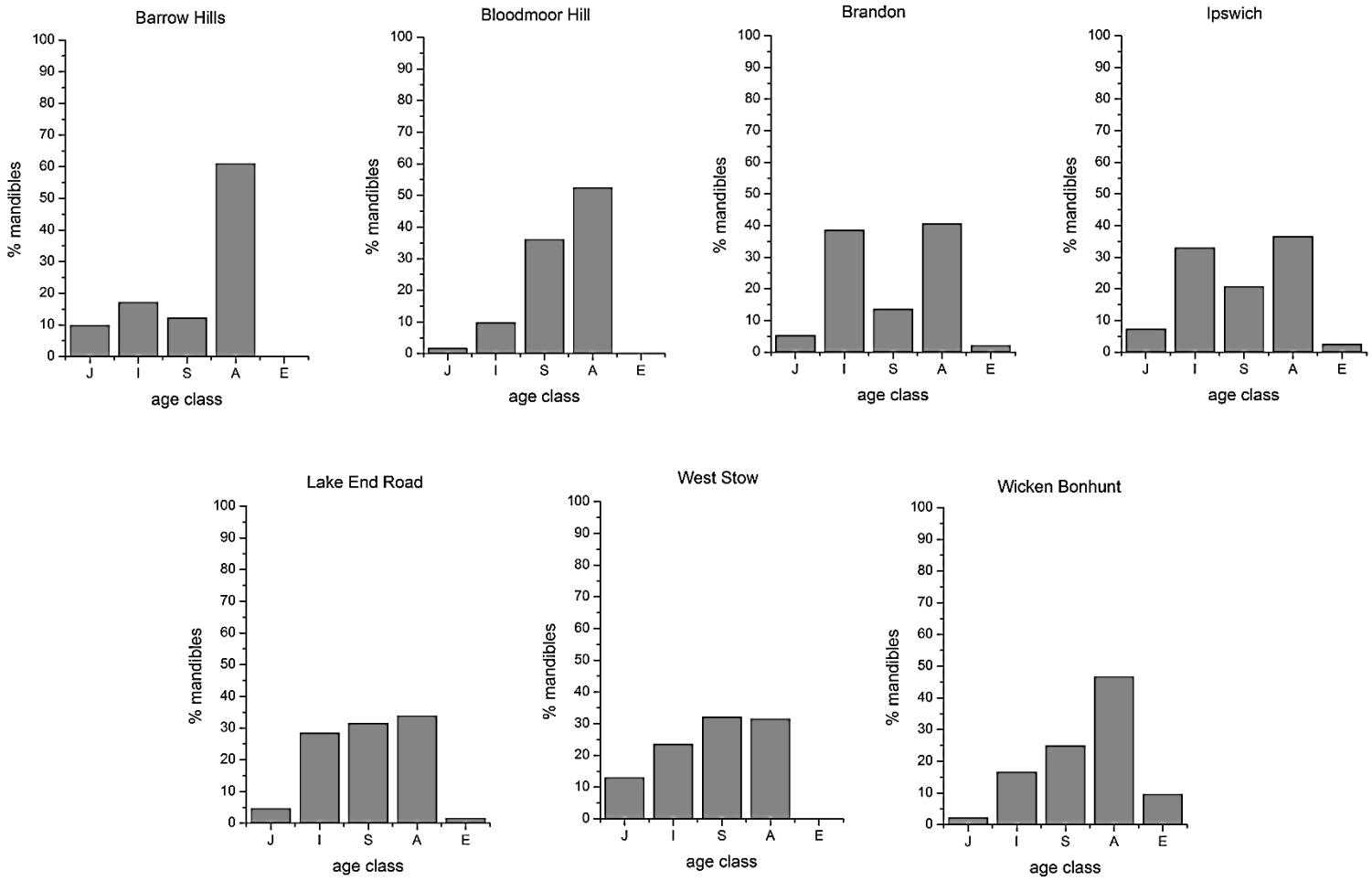


Figure 5.16 – Mandibular mortality profiles for pigs (assemblages with ≥30 aged individuals).

5.5 Paddocks, droveways, and causeways

Rectilinear ditched boundary features are a recognized innovation at Anglo-Saxon rural settlements from around the late 6th century onwards.[278] Such features can take very different forms on radically different scales, and consequently are open to different functional interpretations. The principal concern in this chapter, however, is with those ditched complexes which may plausibly be interpreted as paddocks (rectilinear enclosures, often without internal structures) and droveways (extended parallel linear ditches). Some of the complexes illustrated below have morphological features which are especially suggestive of pastoral functions. For instance, some appear to have entrances placed at corners, *e.g.* at Godmanchester and Gamlingay (Figure 5.17). As Pryor argues, corner entranceways serve an important function in pastoral farming by funnelling livestock which can otherwise be very difficult to drive through a gate.[279]

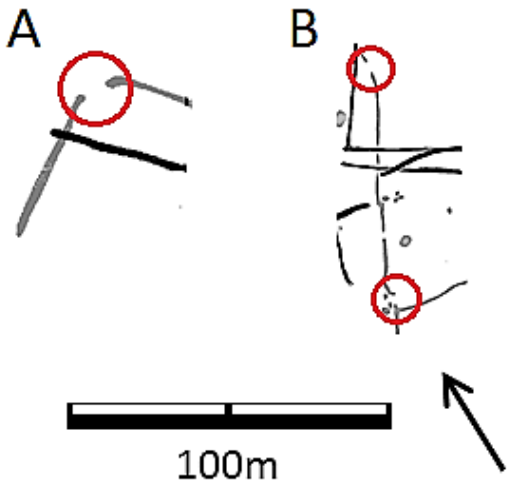


Figure 5.17 – Apparent corner entrances at (A) Godmanchester and (B) Gamlingay – after Gibson 2003, p.204, fig.42 and Murray 2005, p.182, fig.10.

[278] Hamerow 2012 pp.73–83.
[279] Pryor 1998 p.101.

While droveway/paddock interpretations are not always incontrovertible, they are considered at least consistent with the morphologies of features at the sites listed in Table 5.8 and mapped in Figure 5.18. For comparative purposes, plans of the complexes listed in Table 5.8 are reproduced to the same scale in Figures 5.19–5.21.

The selection is by no means a comprehensive inventory of sites in the study regions with rectilinear ditched features. However, those which have been omitted from the list are either too small, poorly dated, or morphologically indistinct to be plausibly interpreted as paddocks and/or droveways (*e.g.* Lower Icknield Way, Market Lavington, Friston); or of such different size and/ or shape as to be considered a distinct phenomenon (*e.g.* the vast enclosure at Wolverton Turn).

Table 5.8 – Sites with possible paddock/droveway complexes in the study regions.

site	gazetteer no.	chronology
Cherry Orton Road	CA4	C7±
Fordham	CA10	C7±
Gamlingay	CA22	C7±
Lechlade	GL7	C7±
Wantage	OX18	C7±
Godmanchester	CA11	C7±
Pennyland	BU3	C7-8
Cottenham	CA13	C7-9
Harston Mill	CA23	C7-9
Bletchley	BU10	C7-9
Yarnton	OX10	C7-9
Terrington St Clement	NO5	C8-9
Downham Market	NO12-13	C8-9
West Fen Road, Ely	CA7-8	C8-9
RAF Lakenheath	SU7	C8-9

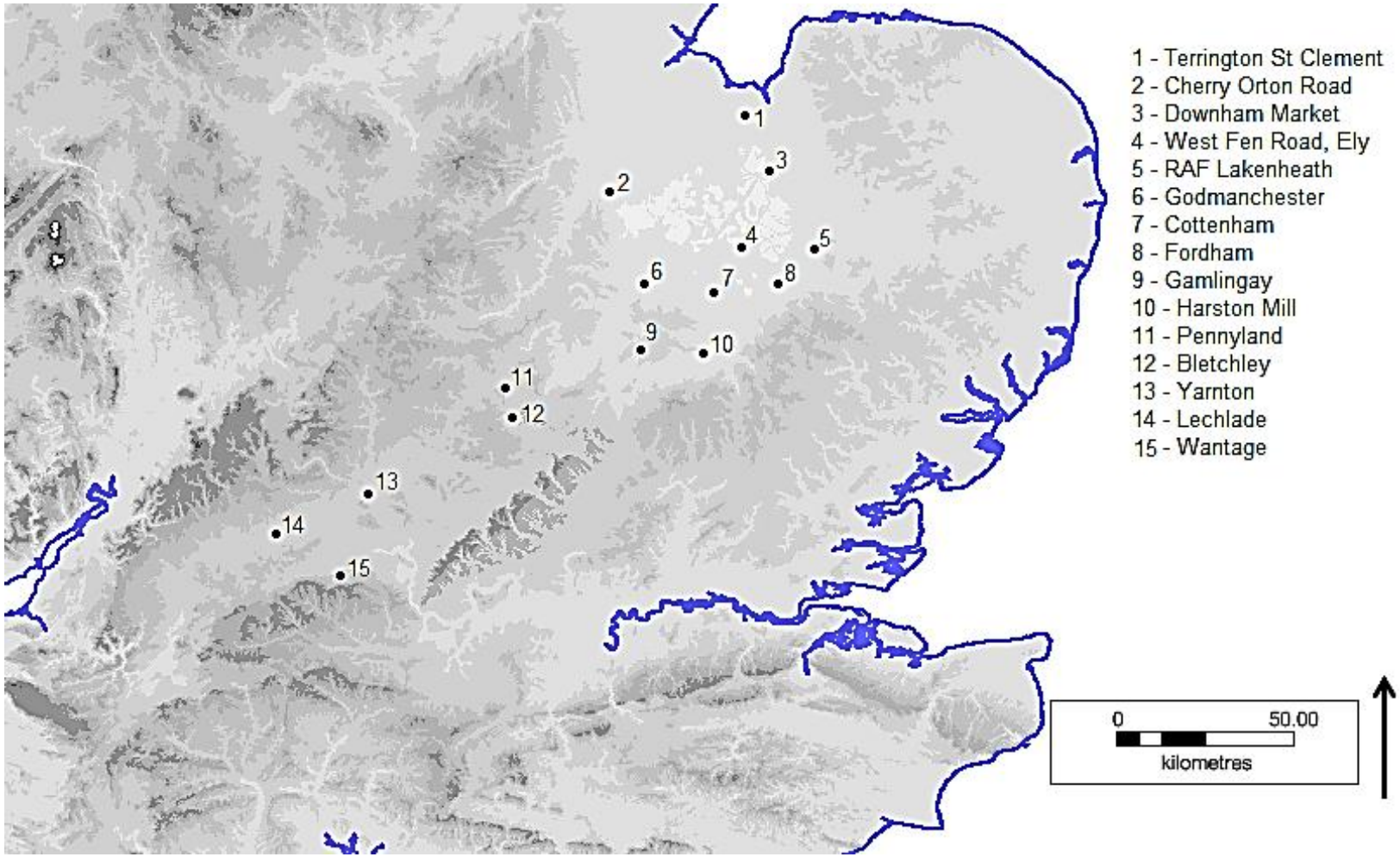


Figure 5.18 – Map of sites with possible paddock and droveway complexes (Digital Mapping Data © Collins Bartholomew 1995).

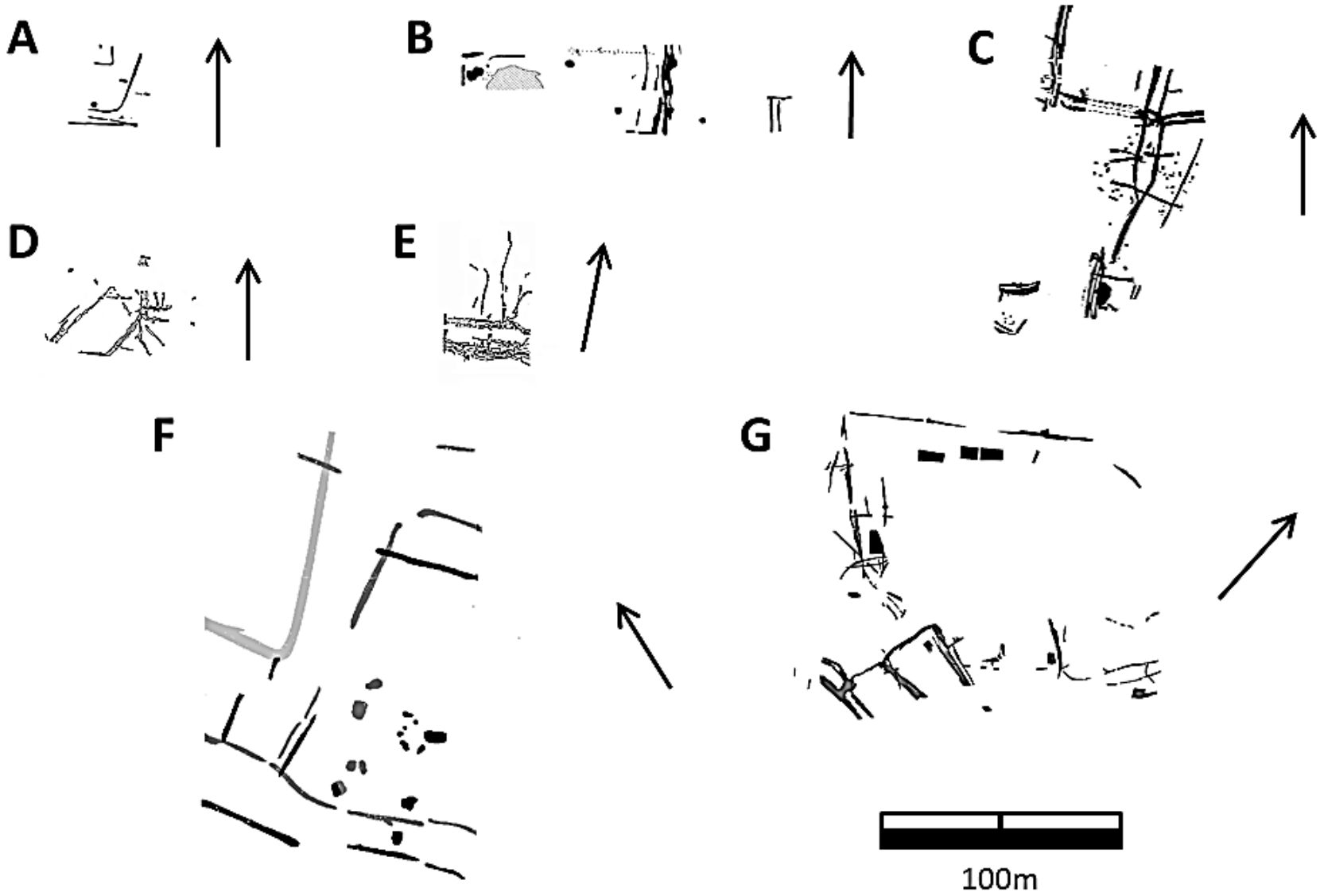


Figure 5.19 – Plans of droveway/paddock complexes in study regions: (A) Cherry Orton Road, after Wright 2004, p.25, fig.2; (B) Fordham, after Patrick & Rátkai 2011, p.43, fig.3.2; (C) Lakenheath, after Caruth 2006, p.73, fig.43; (D) Downham Market Bypass, after Percival 2001, fig.3; (E) London Road, after Trimble 2001, fig.9 ; (F) Godmanchester, after Gibson 2003, p.204, fig.42; (G) Cottenham, after Mortimer 2000, pp.9–10, fig.7 and 9.

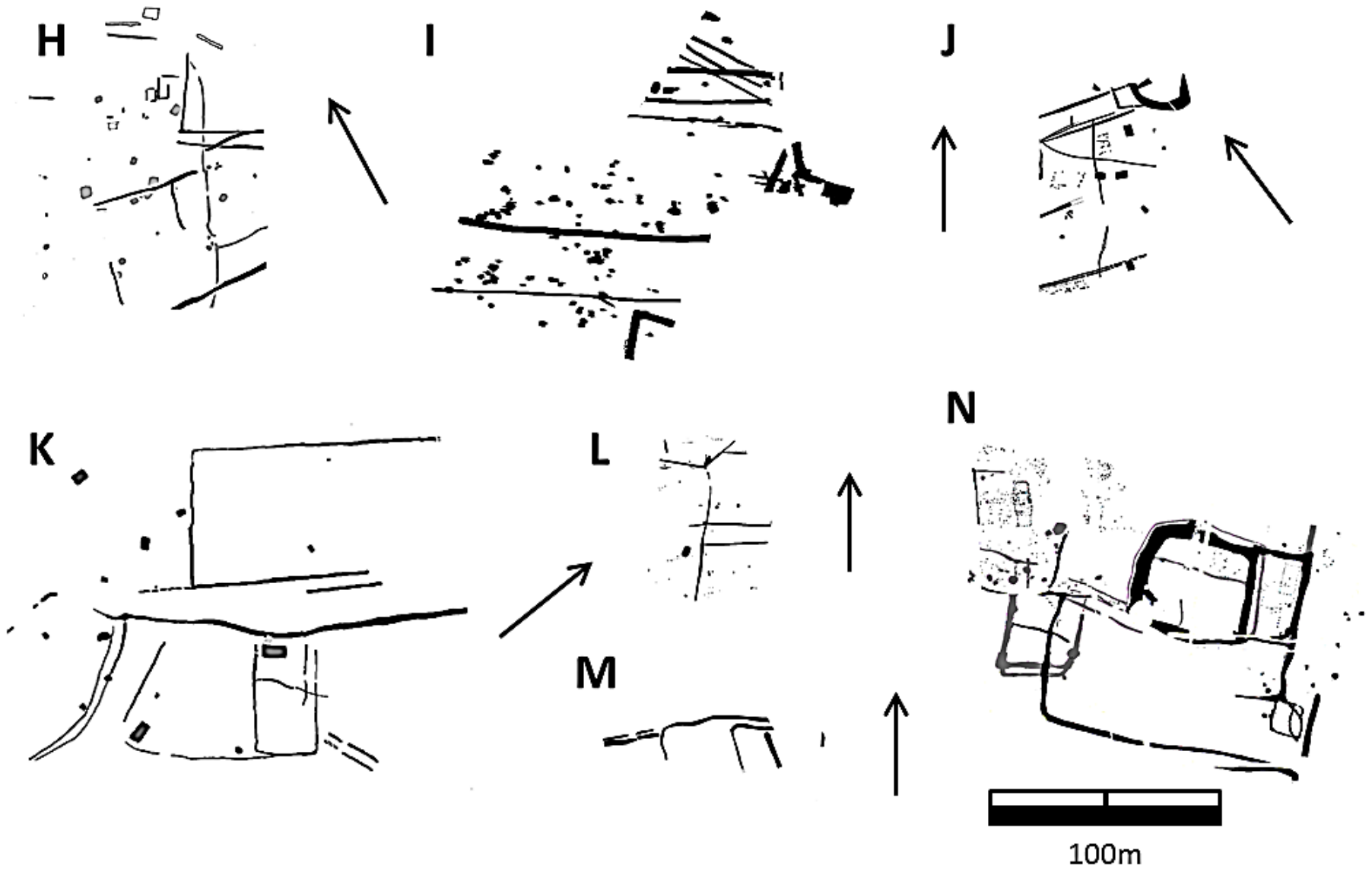


Figure 5.20 – Plans of droveway/paddock complexes in study regions: (H) Gamlingay, after Murray 2005, p.182, fig.10; (I) Harston Mill, after O'Brien (in press), fig.6.1; (J) Lechlade, after Bateman *et al*. 2003, p.41, fig.12; (K) Pennyland, after Williams 1993, p.94, fig.52; (L) Bletchley, after Hancock 2010 p.10, fig.4; (M) Wantage, after Holbrook & Thomas 1996, p.126, fig.9; (N) Yarnton, after Hey 2004, p.20, fig.1.5.

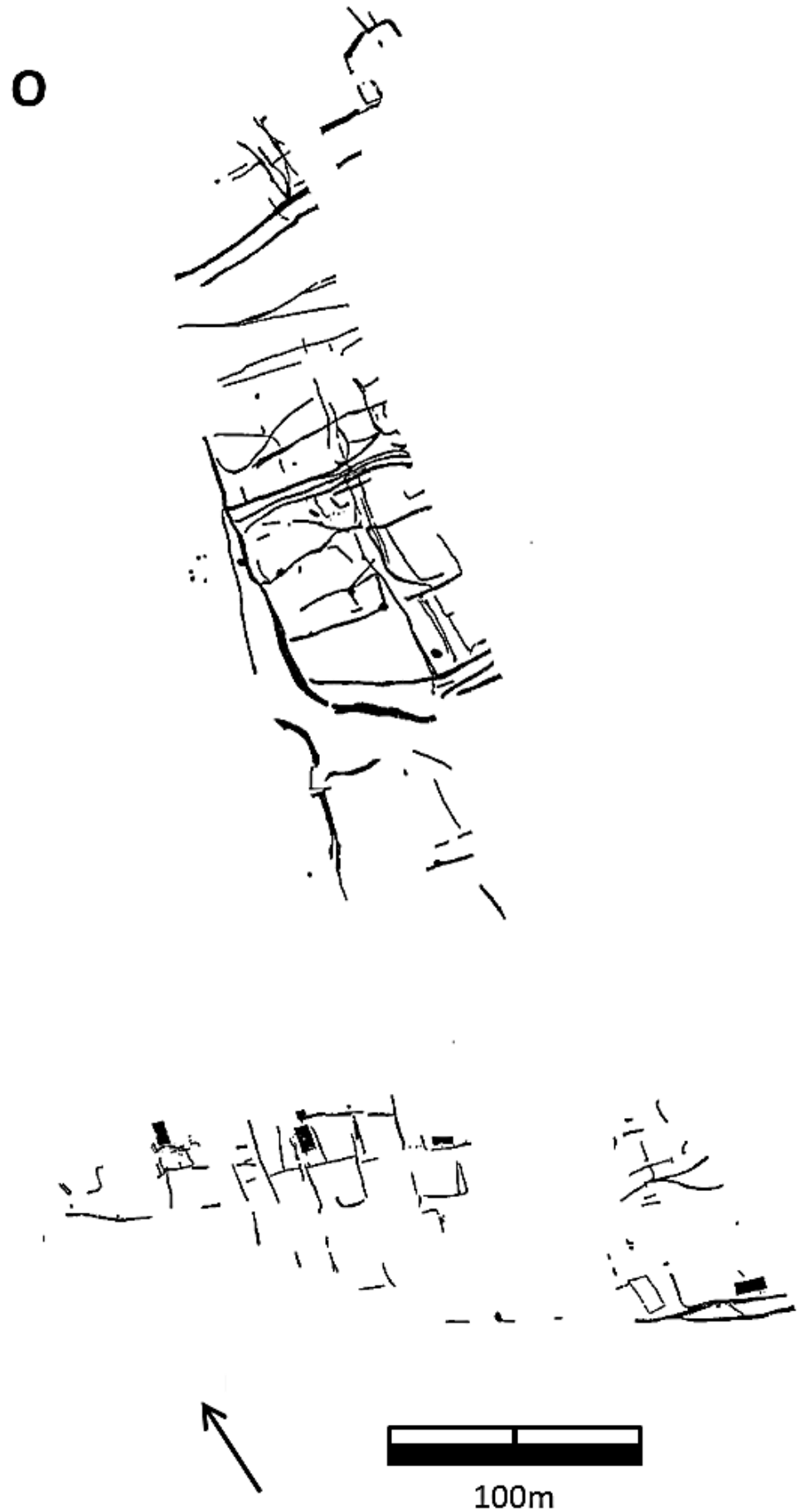


Figure 5.21 – Plans of droveway/paddock complexes in study regions: (O) West Fen Road, Ely – Consortium (north) and Ashwell (south) sites, after Mortimer *et al.* 2005, p.145, fig.7.1.

There appears to be some geographical coherence to the listed examples, whose distribution corresponds broadly with the Upper Thames and Great Ouse valleys. Geologically, these sites cluster around both the fenland and low-lying clay vales with gravel terraces. The apparent concentration of rectilinear enclosures near the fen-edge observed by Hamerow is thus reaffirmed, and would appear to be consistent with Hamerow's interpretation, in which poorly-drained landscapes necessitated both the rapid mobilisation of plough oxen and the overwintering of livestock close to settlement sites (because of a lack of sufficiently dry pasture), and therefore encouraged the development of pastoral infrastructures such as those listed above.[280] In addition, there is some distributional correspondence between the droveway/paddock complexes and the assemblages that are relatively rich in ovicaprid bones (Figure 5.22), perhaps suggesting a specific connection with sheep husbandry, at least in East Anglia.

In addition, it is worth noting the archaeological evidence for causeways and other river crossings which has been identified at three locations in the study regions (Figure 5.23). This is not to suggest that these features were all necessarily and exclusively associated with the movement of livestock across the landscape. It is assumed only that they could *potentially* have facilitated transhumance, and thus formed part of a wider network of pastoral infrastructures.[281]

[280] Hamerow 2012 pp.89–90.
[281] *Cf.* Brunning 2010 for a comparable structure of 7th-8th century date in the Somerset Levels.

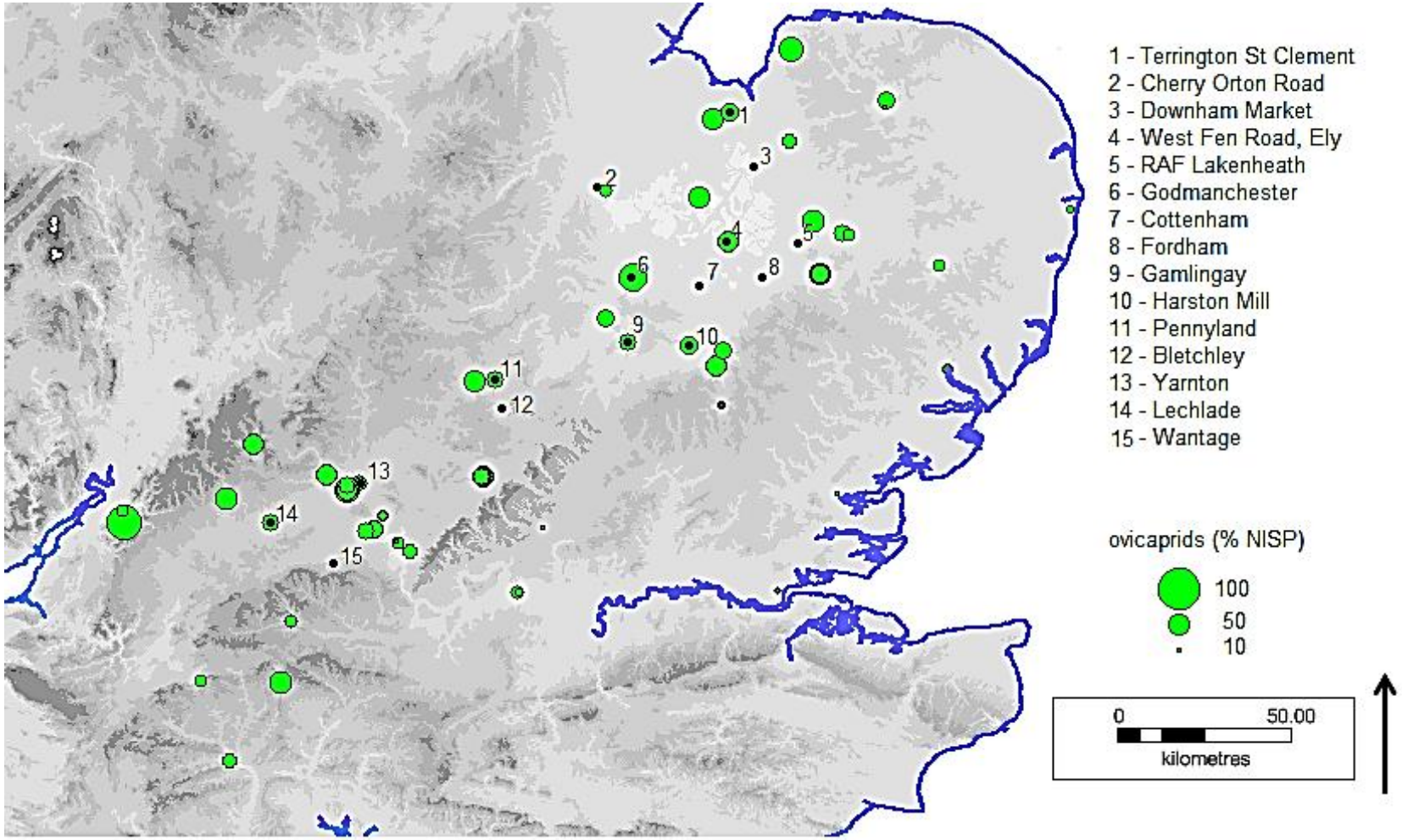


Figure 5.22 – Map comparing distribution of droveway/paddock complexes with ovicaprid NISP percentages – *cf.* Fig.5.10B (Digital Mapping Data © Collins Bartholomew 1995).

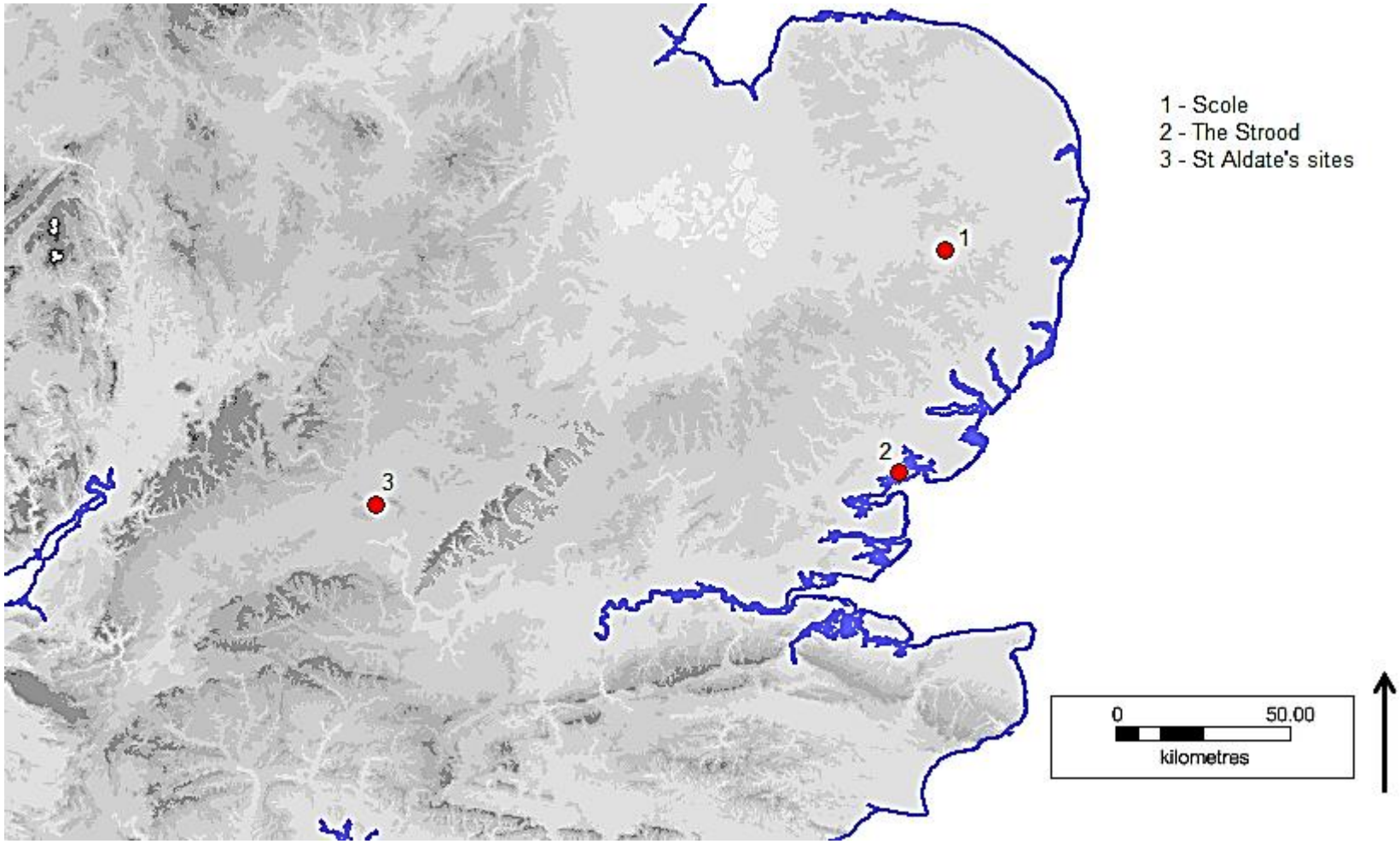


Figure 5.23 – Map of sites with evidence for causeways and river crossings (Digital Mapping Data © Collins Bartholomew 1995).

A possible causeway has been identified at Scole (SU1), where two parallel alignments of oak piles were discovered along the edge of a palaeochannel in the Waveney valley in Suffolk (Figure 5.24). Radiocarbon determinations from two selected piles fall within the 5th-7th centuries (cal.AD 563-658; cal.AD 429-652, at 95% confidence), while a third determination is of 4th-6th century date (cal.AD 339-541 at 95% confidence).[282] The structure may therefore have been built in the 6th century, or perhaps earlier, with the later piles representing repairs.

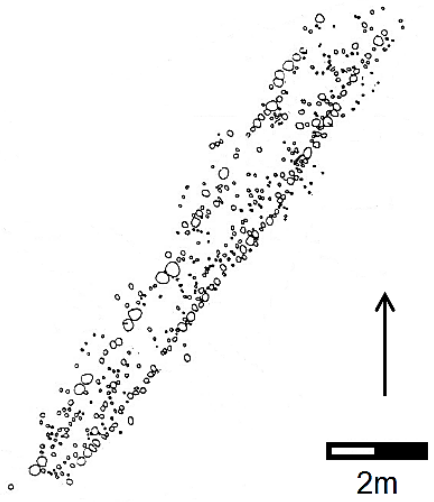


Figure 5.24 – Possible causeway at Scole – after Ashwin & Tester (in press), Fig. 3.78.

Secondly, a dendrochronological study of oak piles from the Strood (ES6) – an artificial causeway leading from the Essex coast to Mersea Island – produced felling dates *circa* AD 684-702, indicating that this structure may have been constructed, or at least repaired, in the Mid Saxon period.[283]

Finally, successive excavations in the St Aldate's area of Oxford (OX11-13) have suggested the existence of artificial crossings between the alluvial islands on the floodplain. According to the most recently published interpretation, based upon Robinson's palaeoenvironmental sequence for the development of the floodplain, a cobbled surface at the BT Tunnel site could represent a

[282] Ashwin & Tester (in press) pp.84–85: 1435±35 BP, 1495±65 BP, and 1625±40 BP, calibrated by author with IntCal09, using *OxCal* 4.2 © C. Bronk Ramsey 2013.
[283] Crummy *et al.* 1982.

causeway-cum-ford, possibly in use by the late 6th or early 7th century (a plank in the overlying silt was felled *circa* AD 577-619). Cattle hoof-prints preserved at the nearby Police Station site, at a comparable place in the alluvial sequence, hint more directly at livestock-movement among the floodplain islands.[284] For the Mid Saxon period, evidence consists of a putative bridge trestle at the BT Tunnel site (cal.AD 660-900), wattle revetments at the Trill Mill Stream site (cal.AD 660-990), and a complex sequence at 79-80 St Aldate's including further revetments and a clay bank which may represent a causeway (thermoluminescence date of AD 631-779), although this interpretation has been questioned.[285]

While an exclusively pastoral function cannot be demonstrated for these crossings, and the sample size is undoubtedly very small, it may nonetheless be noted that their chronologies and locations are different to those of the paddock/droveway complexes. Whereas the latter showed some geographical correspondence with the distribution of relatively ovicaprid-rich assemblages, particularly around the catchment of the Great Ouse, the three riverine crossings are more associated with the 'cattle-rich crescent' extending through central/eastern East Anglia and along the Thames valley. The respective causeway and droveway/paddock zones thus meet in the Upper Thames valley, an area noted above for its comparatively 'balanced' NISP ratios (with both cattle and ovicaprids fairly well represented).[286]

[284] Dodd 2003 pp.12–13.
[285] Dodd 2003 pp.15–16; Durham 1977 pp.176–9.
[286] See above, §5.3.

5.6 Conclusions

While much of the evidence discussed in this chapter is ambiguous, and many of the interpretations somewhat equivocal, it is nonetheless possible to discern some prevailing patterns that are mutually consistent. From around the 7th century onwards, there is a slight decline in cattle-rich assemblages (by percentage NISP) and a corresponding slight increase in ovicaprid- and/or pig-rich assemblages. This trend is accompanied by the appearance of specially managed herds at a few sites, including some cattle and sheep kept for their meat, but more often those kept for wool, milk, manure and/or traction. At the same time, the closer spatial management of livestock is evidenced by droveway and paddock complexes, and possible symptoms of 'penning elbow' among sheep.

In geographical terms, meanwhile, an approximate differentiation is evident between cattle- and pig-rich areas (*e.g.* central and south-eastern East Anglia, and parts of the Thames valley) and ovicaprid-rich areas (*e.g.* the Cotswolds, Fens, and fen-edge); there may be a tenuous link between these distribution patterns and those of river crossings and droveway/paddock complexes respectively. More specifically, evidence for specialization in the secondary products of sheep seems to be concentrated at East Anglian sites (Bloodmoor Hill, Brandon, Ely, Wicken Bonhunt, Godmanchester, North Elmham Park).[287] Indeed, evidence for specialization in the secondary products of sheep *and* cattle seems to be restricted to Region 2 (East Anglia/Essex), whereas evidence for specialization in their primary products is restricted to Region 1 (Upper/Middle Thames and environs).

Overall, then, the zooarchaeological and settlement evidence from the study regions would seem to be consistent with increased specialization in animal husbandry from the 7th century onwards, especially in East Anglia, and especially for the secondary products of sheep. The

[287] See above, §5.4.2.

clearest evidence for such specialization remains Crabtree's extensive work on the Brandon and Wicken Bonhunt assemblages, to which this discussion is indebted; but other assemblages too have been found to hint at a similar pattern, especially perhaps those with high-status/ecclesiastical associations (*e.g.* Ely and North Elmham Park).

6 Charred Plant Remains

6.1 Introduction

The purpose of this chapter is to analyse the charred plant macrofossil data, which constitute the largest part of the archaeobotanical dataset. There is a basic assessment of the charred dataset: its analytical value, its geographical coverage, and chronological difficulties or ambiguities encountered. An inventory then discusses the representation of crops and other useful taxa in the charred dataset, and individual samples are considered in terms of dominant crop types and crop processing stages; some consideration is also given to samples of unusual composition. These preliminary analyses then give rise to more detailed results and interpretations, presented in a problem-oriented fashion. The scale of production and processing over time is addressed through the nature, abundance, density and contextual origins of charred macrofossils. Chronological patterns in the occurrence and relative abundance of different cereal taxa are then considered, with particular attention given to the relationship between barley and free-threshing wheat. Finally, investigations into weed ecology – including possible implications for our understanding of crop husbandry practices – are presented.

6.2 Assessment

6.2.1 Charred remains within the dataset

Four modes of preservation are represented within the archaeobotanical dataset. Charred remains constitute the largest proportion of the dataset, waterlogged remains are much scarcer, while mineralized macrofossils and ceramic impressions are both extremely rare; in a small number of assemblages and samples, two modes of preservation are represented simultaneously (Table 6.1). The term 'assemblage' here refers to material from the same site and phase, with the same mode of preservation.[288]

Table 6.1 – Representation of modes of preservation in the archaeobotanical dataset.

		samples	assemblages
principal means of preservation	charring	736	111
	waterlogging	40	13
	mineralization	3	4
	ceramic impression	n/a	4
dual means of preservation	charring/mineralization	6	3
	charring/waterlogging	1	2

The charred dataset includes material from 96 sites in the study regions, comprising 111 assemblages and 736 samples, in addition to the sub-assemblage of ten samples from the Mid Saxon monastic site at Lyminge, Kent (Appendix 3). A charred assemblage from Great Wakering (ES9), derived mostly from the fills of a putative Mid Saxon grain oven, was also taken into consideration.[289] However, since the latter was published too late and too summarily (lacking quantified detail) to be fully integrated into the following analyses, it has not been treated as part of the core dataset. Unless otherwise stated, the results in this chapter concern only the core dataset from the study regions, with the Lyminge, Great Wakering and other additional data introduced explicitly for comparative purposes.

[288] For terminology employed in this chapter, see above, §3.8.1.
[289] V. Fryer in Dale *et al.* 2010 pp.219–220; see below, §7.3.3.

There are some disparities in the nature and quality of the charred botanical data. For six of the 96 sites with charred remains, data are available only at the level of assemblages, not for individual samples.[290] Among the 736 individually detailed samples, 578 contain fully quantified items (including one with fragments only – no whole items or equivalent) while 158 have only semi-quantitative 'presence' data (including three which contain only fragments – no whole items or equivalent). The 15 samples from Wilton (WL9) are slightly problematic in that only chaff items and non-cereal seeds are individually quantified; for cereal grains, the total quantity in each sample is given, but individual taxa are not separately quantified. Hence, these 15 samples are not suitable for all of the quantitative analyses which follow later in this chapter.

6.2.2 Geographical distribution of assemblages and samples

Charred archaeobotanical data are not evenly distributed throughout the study regions. The geographical distribution of charred assemblages echoes the general distribution of sites in the project dataset: Cambridgeshire is the best represented county, followed by Oxfordshire, Buckinghamshire, Norfolk and Suffolk. By contrast, Berkshire, Gloucestershire, Wiltshire and Essex are very poorly represented (Figure 6.1). The individual samples exhibit a comparable distribution pattern, skewed somewhat by four unusually well-represented assemblages which contain ≥30 samples each, all in Suffolk (Figures 6.2–6.3): Flixton (SU3) with 30 samples, Eye (SU4) with 59 samples, Brandon (SU5) with 50 samples, and Ipswich (SU14) with 35 samples.

The botanical data for Flixton and Eye are, at the time of writing, available only in the form of semi-quantitative assessments, rather than fully quantitative analyses – a fact which not only limits their analytical utility, but which could also help to explain the relatively high frequency of

[290] Great Linford (BU2), Stonea Grange (CA6), Two Mile Bottom (NO14), Wickhams Field (BE5), Worton (OX8), and Walton Vicarage (BU16).

samples recorded in these assemblages, since assessments are inherently more inclusive than quantified analyses.[291]

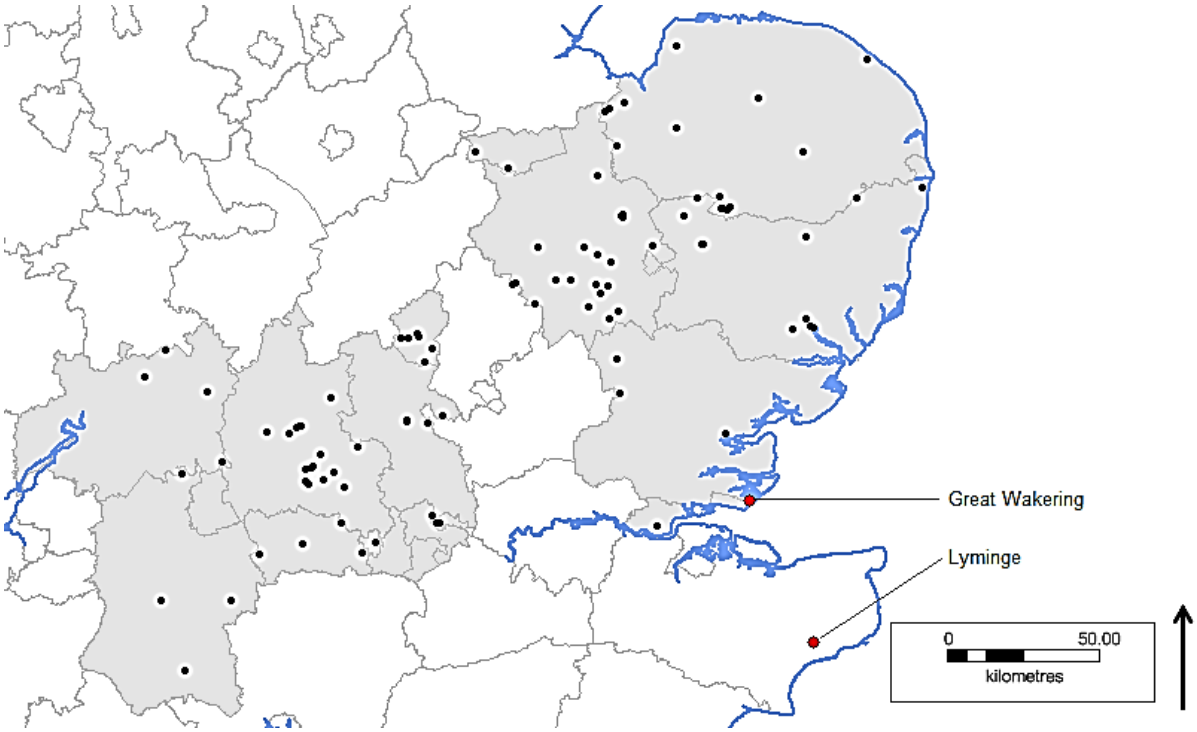


Figure 6.1 – Distribution of sites with charred botanical assemblages in the study regions (Digital Mapping Data © Collins Bartholomew 1995).

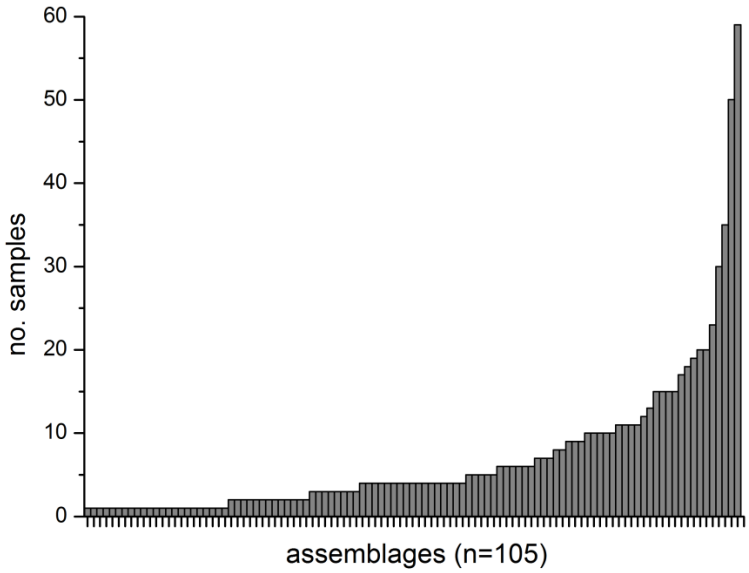


Figure 6.2 – Frequency of charred samples per assemblage.

[291] See below, §6.5.1.

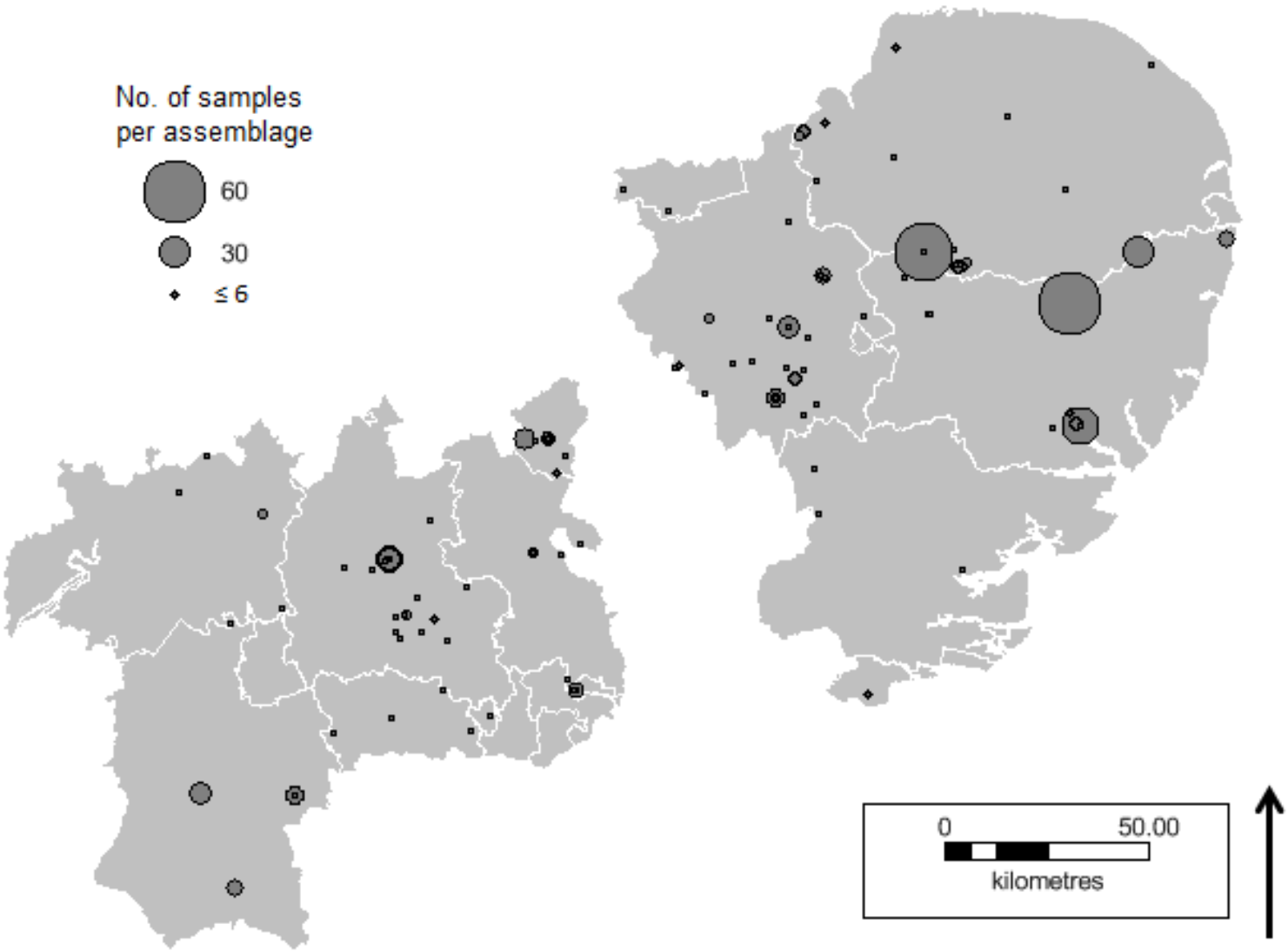


Figure 6.3 – Mapped distribution of charred assemblages, displaying frequencies of samples per assemblage (Digital Mapping Data © Collins Bartholomew 1995).

6.2.3 Analysts

The charred dataset represents the work of 29 archaeobotanists (including one anonymous), eight of whom are especially prolific, accounting for more than 70% of assemblages: M. Jones, J. Letts, R. Scaife, M. Robinson, R. Pelling, C. Stevens, and especially P. Murphy and V. Fryer (Figure 6.4). The dominance of these eight analysts lends some degree of inter-worker uniformity to the dataset, although it should be noted that their work is not evenly distributed within the study regions. The work of Fryer and Murphy, for example, is almost exclusively restricted to East Anglia and Essex, while that of Pelling, Robinson and Letts is heavily concentrated in the Upper/Middle Thames valley and environs. The work of the 21 less well-represented analysts may be considered to have lower comparative value, although this is not to suggest that the work is any less reliable in itself.

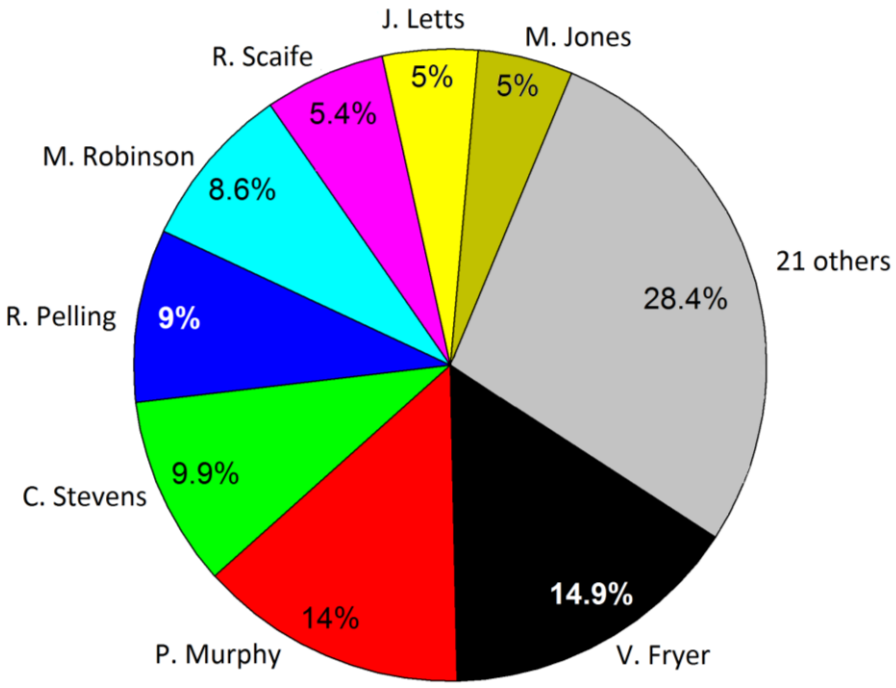


Figure 6.4 – Representation of archaeobotanists in the charred dataset, in terms of assemblages studied (total = 111 assemblages).

6.2.4 Dating issues

The charred assemblages and samples are assigned to chronological categories in Table 6.2, following the criteria and terminology set out above (§3.5). Most assemblages and samples are classifiable as Early, Intermediate or Mid Saxon, with only a small minority being classed as Generic.[292] The Sub-Roman category is represented only by Stonea Grange and Childerley Gate. Two Mid Saxon assemblages – those from Sedgeford and Harston Mill – each incorporate a small sub-assemblage datable to the later 9th century.

In two cases, a charred sample's botanical composition has been thought to conflict with the artefactual date of its parent context. Thus <SMB1> from Brandon and <AL1> from Alchester both derive from contexts considered on artefactual grounds to be Early Saxon. Yet the botanical composition of <SMB1> is thought to be Iron Age in character, that of <AL1> Romano-British. In both cases, the taxon considered most anomalous in a 5th-6th century context is spelt wheat, whose glume bases dominate the cereal component of both of these samples.[293] While the context at Brandon remains unpublished, that at Alchester has been published and the stratigraphic integrity appears strong, such that the spelt wheat is here considered to be of genuine 5th-6th century date.

At Lake End Road there is a conflict between the 5th-7th century radiocarbon date range of the charred plant remains in <LER1> (cal. AD 430-660), and the 8th-9th century date of the associated pottery. If the radiocarbon determination is accepted, then the plant remains must be assumed to represent residual 5th-7th century material in a Mid Saxon deposit.[294] The possibility is thus raised that residual 5th-7th century material might also be represented in other presumed 8th-9th century contexts at this site. Provisionally, in the absence of additional data, <LER1> has been

[292] See further below, §6.5.1, Figures 6.14–6.16.
[293] Booth *et al.* 2001 pp.202–207; Murphy & Fryer 2009 p.11.
[294] Foreman *et al.* 2002 pp.58–60.

treated as being of 5th-7th century date, but the remaining samples from the site have retained their published 8th-9th century dates.

The samples from the SFB at Wilton are here considered to be of 'Intermediate' date. Sample <WIL20>, however, despite being listed in the original report alongside the Saxon samples from the SFB, in fact derives from a pit elsewhere described as Saxo-Norman. The relevance of this sample for the current study is therefore questionable.[295]

Finally, <BFD1>, the sole charred sample from Dumbleton, is here assigned a Generic date, because the handmade Early/Mid Saxon pottery from its parent context is not chronologically diagnostic. However, several charred plant macrofossils (including those of glume wheats) in other samples from the site returned radiocarbon date ranges spanning the Early, Mid and Late Saxon periods, despite deriving from deposits otherwise attributed to the Late Bronze Age or Iron Age.[296] Since neither the extent of contamination/residuality, nor the reliability of the radiocarbon determinations, can be assessed here, these problematic samples have not been included in the core dataset.

[295] Pelling in De'Athe 2008 pp.21-27.
[296] Coleman *et al.* 2006 p.64, Table 9.

Table 6.2 – Inventory of charred assemblages in the study regions. Where no. samples = ✓, data available at assemblage level only.

assemblages		no. samples				
		Sub-Roman	Early Saxon	Inter-mediate	Mid Saxon	Generic
Alchester	OX3		1			
Ashwell Site (Ely)	CA8				6	
Bancroft	BU5		1			
Barrow Hills	OX21		10			
Barton Court Farm	OX22		2			
Benson	OX17			2		
Berinsfield	OX25					7
Bishop's Cleeve	GL2			3		
Bletchley	BU10				7	
Bloodmoor Hill	SU2					15
Brandon – Early	SU5		1			
Brandon - Mid	SU5				50	
Brandon Road North - Early	NO17		2			
Brandon Road North - Mid	NO17				2	
Brettenham	NO20		6			
Chadwell St Mary	ES11			6		
Cherry Orton Road	CA4			1		
Chiefs Street	CA9				2	

assemblages		no. samples				
		Sub-Roman	Early Saxon	Inter-mediate	Mid Saxon	Generic
Chieveley	BE6					4
Childerley Gate	CA18	3				
Cogges	OX5		4			
Collingbourne Ducis - Early	WL6		1			
Collingbourne Ducis - Mid	WL6				17	
Consortium Site (Ely)	CA7				15	
Cottenham - Intermediate	CA13			20		
Cottenham - Mid	CA13				5	
Cresswell Field	OX9				4	
Criminology Site	CA19		4			
Didcot	OX31		4			
Dumbleton	GL1					1
Eaton Socon	CA15		2			
Eye	SU4		59			
Eynesbury	CA16		6			
Eynsham	OX7			3		
Flixton	SU3		30			
Forbury House	BE2				1	

assemblages		no. samples				
		Sub-Roman	Early Saxon	Inter-mediate	Mid Saxon	Generic
Fordham	CA10				2	
Gamlingay - Intermediate	CA22			4		
Gamlingay - Mid	CA22				1	
Godmanchester	CA11				8	
Goring	OX20		1			
Great Linford	BU2					✓
Handford Road	SU13		11			
Harston Mill - Early	CA23		6			
Harston Mill - Mid	CA23				10	
Harston Mill - Generic	CA23					15
Hintlesham	SU12				1	
Hinxton Quarry	CA28		1			
Hungerford	BE7					1
Hutchison Site	CA21				11	
Ingleborough	NO7				9	
Ipswich - Intermediate	SU14			1		
Ipswich - Mid	SU14				35	
Kilverstone	NO16		9			
Lackford Bridge Quarry	SU8				3	
Lake End Road - Early	BU22		1			
Lake End Road - Mid	BU22				13	
Latton Quarry	WL2		2			
Lechlade	GL7			4		

assemblages		no. samples				
		Sub-Roman	Early Saxon	Inter-mediate	Mid Saxon	Generic
Littlemore	OX14		4			
Lot's Hole	BU21				4	
Lower Cambourne	CA17					2
Lower Icknield Way	BU18			5		
Lower Slaughter	GL3				8	
Marham	NO8				3	
Market Lavington	WL5			20		
Neptune Wood	OX29			2		
Outwell	NO11		1			
Pampisford	CA24			1		
Pennyland - Early	BU3		4			
Pennyland - Intermediate	BU3			10		
Pennyland - Mid	BU3				11	
Pitstone	BU11		3			
RAF Lakenheath	SU7				4	
Redcastle Furze	NO18			12		
Rosemary Lane	CA20				4	
Rycote	OX15					1
Sedgeford	NO1				10	
Slough House Farm	ES7			4		
Spong Hill	NO4		5			
Spring Road	OX24		4			
Stansted Airport	ES3		2			

assemblages		no. samples				
		Sub-Roman	Early Saxon	Inter-mediate	Mid Saxon	Generic
Stonea Grange	CA6	✓				
Sutton Courtenay	OX30			4		
Taplow Court	BU20				2	
Terrington St Clement	NO5				7	
Two Mile Bottom	NO15		✓			
Walpole St Andrew	NO6				11	
Walton Lodge	BU15			1		
Walton Orchard	BU13			10		
Walton Road Stores	BU12					9
Walton Street	BU17			3		
Waterbeach	CA14		5			
Wavendon Gate	BU7		4			
West Stow - Early	SU9		1			
West Stow - Generic	SU9					1
Whitehouse Road	SU11				6	
Wicken Bonhunt - Intermediate	ES1			1		
Wicken Bonhunt - Mid	ES1				1	
Wickhams Field	BE5				✓	
Willingham	CA12				4	
Wilton	WL9			15		
Wittering	CA1				3	
Witton	NO2		2			

assemblages		no. samples				
		Sub-Roman	Early Saxon	Inter-mediate	Mid Saxon	Generic
Wolverton Turn	BU4				18	
Worton	OX8				✓	
Wymondham	NO14					1
Yarnton - Early	OX10		5			
Yarnton - Intermediate	OX10			19		
Yarnton - Mid	OX10				23	

6.3 Crop inventory

This section provides a summary account of the taxa recorded in the charred dataset, with a primary focus upon cereals and other potential field crops, and some brief consideration of wild and woody taxa which might also have been exploited in the Early/Mid Saxon period. Observations are made concerning the identification of taxa, their ubiquity or scarcity (via semi-quantitative presence analysis),[297] and in some cases the abundance of their charred remains. The principal quantitative analyses, however, are reserved for the following sections.[298]

6.3.1 Cereals

The term '*Hordeum* L.' is here used to embrace all varieties of barley recorded in the charred dataset except for four seeds of tentatively identified wall barley (*Hordeum* cf. *murinum* L.), a wild grass, in <WFR1>. The remaining identifications are assumed, as in their original reports, to represent cultivars. The use of this umbrella term deliberately omits to distinguish between six-row and two-row, hulled and naked, dense- and lax-eared varieties of cultivated barley. Charred grains and rachis fragments are often insufficiently well-preserved to allow such distinctions to be made.[299] Positive identifications of naked and two-row varieties of barley are especially rare in the charred dataset.[300] Nine grains of two-row barley (listed as '*Hordeum distichon*') were identified in <WKB1> from Wicken Bonhunt, but with no indication of the criteria by which they were distinguished as such. In addition, Vaughan-Williams suggests that two-row barley might be present alongside six-row barley in <FOR1> from Forbury House, because of the relatively high ratio of straight to twisted grains in that sample.[301] Positive identifications of naked

[297] See above, §3.9.2.
[298] See below, §§6.4–6.7.
[299] Moffett 2011 p.351.
[300] This was also true of the Lyminge sub-assemblage, although a lemma base in <LYM30> may belong to two-row or lax-eared six-row barley: see Appendix 3.
[301] A.K.G. Jones n.d. p.8, Table 1; Vaughan-Williams 2005 p.44

barley grains occur in only four samples: <CRM3>, <FOR1>, <MFB14>, and <WFR1>. The remaining records of barley frequently employ generic or tentative nomenclature, such as '*Hordeum* sp.', *'Hordeum sativum*', or '*Hordeum vulgare sensu lato.*' Hence, there is little evidence in the dataset to contradict Moffett's assertion that the majority of Anglo-Saxon barley was probably six-row hulled *Hordeum vulgare* L. The more specific identifications of different varieties of barley are too few and too tenuous to admit further analysis.

Wheats are variously categorized as glume wheats, free-threshing varieties, and indeterminate. Indeterminate wheats are typically the most common among both assemblages and samples, with free-threshing wheats proving almost as ubiquitous, and glume wheats occurring far less frequently (Figure 6.5).

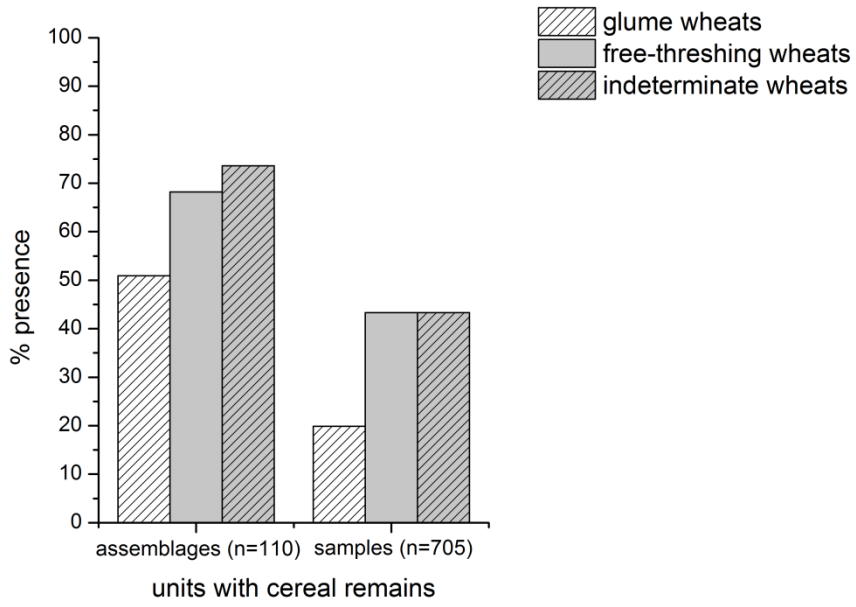


Figure 6.5 – Presence analysis of wheat types, among assemblages and samples with cereal remains.

Two species of glume wheat occur within the charred dataset: emmer (*Triticum dicoccum* Schübl.) and spelt (*T. spelta* L.), besides the generic identification *T. dicoccum/spelta*. It should be noted that, while the glume bases of these two species are often clearly distinguishable,

morphological distinctions between their grains may potentially be more ambiguous, and consequently many of the emmer and spelt grains in the dataset are qualified as '*cf.*' or 'type'.[302] It is also possible that some grains ascribed to free-threshing wheats on account of their well-rounded shape might in fact be poorly-preserved, short, round spelt grains.[303] However, it is beyond the immediate scope of this project to pursue this possibility further, and positive identifications of free-threshing wheat grains have provisionally been accepted as such unless the analyst has expressed specific doubts.

Among free-threshing wheat remains, very few have been positively identified as representing tetraploid varieties: one rachis segment from Bishop's Cleeve is identified as '*Triticum turgidum* type', a single rachis fragment from Eynesbury is ascribed to tetraploid free-threshing wheat, and a single rachis node of '*Triticum turgidum* type' is identified in the assemblage from Great Wakering.[304] These rare instances can be taken as a reminder that, despite the generic terminology employed in many archaeobotanical reports (*e.g.* '*Triticum aestivum sensu lato*') it is not necessary to presume that free-threshing wheats were exclusively hexaploid in this period. In any case, the ambiguity of free-threshing wheat ploidy levels has little impact on the research questions being addressed here. The umbrella category of 'free-threshing wheat' (*Triticum* L. free-threshing) is thought to be sufficient for present purposes.[305]

There is a strong possibility that many, if not most, of the indeterminate *Triticum* L. remains do, in fact, represent free-threshing wheats. Not only are the latter far more common than glume wheats among the positively-identified wheats, but also free-threshing varieties are more prone

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[302] Hillman *et al.* 1996 pp.204–206.
[303] Campbell & Straker 2003 p.23.
[304] The tetraploid wheat rachis nodes identified at Lake End Road were all thought to represent emmer: none was thought to represent a free-threshing variety.
[305] See also above, §3.8.2.

to distortion during the charring process and therefore, arguably, more likely to be rendered indeterminate.[306]

Oats are considered here to be a potential crop, although in many cases the status of *Avena* as a cultivated or wild variety cannot be established with any certainty. While the remains of indeterminate oat (*Avena* L.) occur throughout the regions and periods studied, species-level distinctions between wild (*A. fatua, A. sterilis*) and cultivated (*A. sativa, A. strigosa*) varieties are rare and not always reliable, unless based upon well-preserved floret bases.[307] Floret bases can be identified as being of 'cultivated type', *i.e.* consistent with – but not necessarily definitive proof of – the presence of *Avena sativa* L. This is the case, for example, with the *Avena* floret bases identified in the Lyminge sub-assemblage.[308] However, oat grains *per se* are not considered diagnostic. It is unclear as to how A.K.G. Jones distinguishes between the cultivated '*A. sativa*' and the wild '*A.* cf. *ludoviciana*' (= *A. sterilis* L.) at Wicken Bonhunt and Witton.[309] The remaining wild/cultivar distinctions in the charred dataset concern floret bases and are therefore more reliable, but are of very limited distribution. Floret bases of 'wild' type are identified in six samples, representing five sites (Bloodmoor Hill, Chadwell St Mary, Ipswich, Rosemary Lane, and Brandon); those of 'cultivated' type occur in only three samples at two sites (Lake End Road and Ipswich), besides also the Lyminge sub-assemblage, which is unusual in producing large quantities of cultivar-type *Avena* floret bases. These few records are clearly insufficient to support wider generalizations about the cultivation of oats in the study regions. Since there is no clear way of resolving the ambiguity that surrounds the majority of *Avena* grains recorded in the study regions, in the following analyses both indeterminate and 'cultivated type' *Avena* records have

[306] Boardman & Jones 1990 pp.4–5.
[307] Jacomet 2006 p.52.
[308] Appendix 3.
[309] A.K.G. Jones n.d.; A.K.G. Jones in Lawson 1983 pp.67–68.

been amalgamated into a single category considered as a *potential* crop, in order to maximize available data with minimal loss of usable taxonomic information.

Grains and rachis segments of rye (*Secale cereale* L.) constitute the least widespread category of cereal remains in the charred dataset, but present few interpretative problems. Although occasionally qualified as '*cf.*', and simply termed '*Secale'* in the data-tables for Harston Mill, rye is taken here as a consistent and homogeneous taxonomic category: *Secale cereale* L.

6.3.2 Pulses

Pulses, the edible propagules of large-seeded leguminous plants, are far rarer than cereals, occurring in only 77 assemblages (69.3%) and 269 samples (36.5%). The vast majority of these occurrences are classified as indeterminate large legumes – most often designated '*Vicia/Lathyrus*' – which along with seeds of *Vicia* L. and *Lathyrus* L. could equally represent cultivated or wild species. By contrast, positively-identified leguminous cultivars have a negligible presence in the study regions (Figure 6.6). Lentil (*Lens culinaris* Medik.) is restricted to one seed designated '*cf*.' in <Y49>, and two in <FOR1>; Moffett raises the possibility that it could have been grown as a fodder crop, as documented for the post-medieval period.[310] The more common garden pea (*Pisum sativum* L.) and broad/field bean (*Vicia faba* L.) are far from being ubiquitous, and are only ever identified in relatively small quantities. There are rarely more than two seeds in any given sample, and the highest abundance recorded in the dataset is in <WFR5>, which contains 25 seeds of *Vicia faba* L. No sample has a crop component dominated by cultivated legumes.[311] Given their scarcity, these charred pulses are likely to represent little more than chance contaminants in cereal-dominated assemblages, whether as grain-mimics accidentally harvested with a cereal crop, or as part of mixed processing or cooking waste. They cannot be

[310] Moffett 2011 p.352.
[311] See below, §6.4.1.

considered at all representative of pulse cropping in Anglo-Saxon England, and thus hold little informative potential.

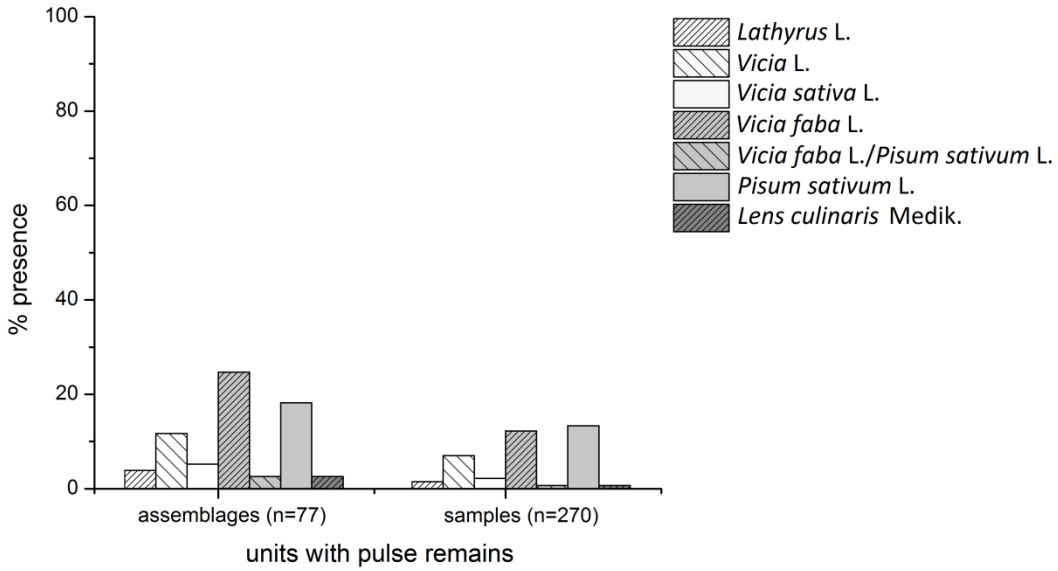


Figure 6.6 – Presence of pulse types, among assemblages and samples with pulse remains.

6.3.3 Flax

Flax (*Linum usitatissimum* L.), which could have been harvested as a fibre crop and/or for the culinary use of its oily seeds, occurs in 17 assemblages (15.3%) and 31 samples (4.2%). Particular concentrations are present in the Mid Saxon assemblages from Yarnton and Brandon, occurring in six and nine samples respectively.

There is little ambiguity surrounding the identifications of flax in the charred dataset. Few are designated '*cf.*', and alternative *Linum* identifications are comparatively rare: fairy flax (*Linum catharticum* L.) occurs in only one sample, indeterminate *Linum* L. in three.

Flax is represented by seeds and fragmentary capsules, and usually occurs in small quantities (<20 items per sample). Occasionally, however, it is very well represented (>80 items

per sample), and even constitutes the dominant crop type in <SMB16> from Brandon, <BRT3> from Brandon Road North, and <LE2> from Lake End Road.[312]

6.3.4 Other possible crops

A range of other species in the charred dataset could represent cultivars, but register only negligible presence and abundance and are therefore of very limited informative potential. One such species is hop (*Humulus lupulus* L.), best known as a flavouring agent in brewing, three seeds of which occur in the Mid Saxon sample <IPS11> from Ipswich. Another similar example is hemp (*Cannabis sativa* L.), which could have been utilized for its fibres, seeds, and perhaps psychoactive properties, only three seeds of which are recorded within the charred dataset: in the Mid Saxon sample <IPS5> from Ipswich. Charred evidence is therefore too minimal to support wider speculation on the cultivation and use of hemp and hop.[313]

The same is true of the two charred grape pips (*Vitis vinifera* L.) in the dataset: one in each of the Mid Saxon samples <EN3> from Eynsham and <Y26> from Yarnton. A further pip was noted in the assessment of a sample from Lake End Road (not fully analysed).[314] Although these three sites are all situated far inland, they were also in receipt of Ipswich Ware and other imported pottery types, an indication of their involvement, via the Thames, in wider trading networks. Hence, the grapes could well have been imported as raisins; the pips alone are insufficient as evidence of Mid Saxon viticulture in the study regions.

Opium poppy (*Papaver somniferum* L.) may have been cultivated for its culinary and/or psychoactive applications, but evidence is limited. Charred seeds occur in four samples across three Mid Saxon assemblages: one in each of <HUT6> and <HUT7> from the Hutchison Site; one in <LW7> from Lake End Road; and 180 '*cf*.' seeds in <Y47> from Yarnton, but these might, as

[312] Discussed further below, §6.4.2.
[313] But *cf.* the mineralized dataset – below, §8.3.
[314] Pelling in Foreman *et al.* 2002, CD-ROM.

Stevens suggests, represent arable weeds rather than cultivated plants.[315] In addition, in the Lyminge sub-assemblage, there are two seeds in <LYM24> and two in <LYM53>.[316]

From this limited evidence, there is little that can be inferred about the status of any of the above species as Anglo-Saxon crops in the study regions. Nonetheless, it may be significant that their occurrences are exclusively Mid Saxon in date. They could potentially, therefore, represent crop-biological innovations of the period.

A number of the species classified in this project as possible arable weeds might also, in fact, represent cultivars, or at least wild species deliberately gathered for culinary or other uses. For instance, fat hen (*Chenopodium album* L.) is often mooted as a food/fodder plant in antiquity.[317] It may have been familiar as a foodstuff in Anglo-Saxon England under the name *melde,* although this name has also been associated with species of orache (*Atriplex* L.), some of which are edible.[318] Fat hen occurs in 118 samples in the charred dataset (15.9%), usually with low abundance (<20 seeds per sample) but occasionally occurring in relatively large quantities (>100 seeds). In one instance it dominates a sample: 508 seeds (75.7%) in the Early Saxon sample <BRT2>, from a well at Brandon Road North. This is the only recorded instance where seeds of fat hen far outnumber those of other possible weed species, in addition to outnumbering cereal grains. One could conjecture that this sample represents rare evidence of a burnt store of fat hen seeds. Otherwise, however, compelling evidence for its cultivation or collection is lacking.

Another exceptional instance of a potentially useful 'wild' species dominating a sample is found at the Hutchison Site, where 700 tentatively identified seeds of black mustard (*Brassica* cf. *nigra* (L.) W.D.J. Koch) constitute 53.1% of the Mid Saxon sample <HUT5>, derived from a well. Most of the other macrofossils in this sample are cereal grains. It is possible that the sample

[315] Stevens in Hey 2004 p.363.
[316] Appendix 3.
[317] Stokes & Rowley-Conwy 2002.
[318] *DOEPN,* s.v. "*melde*", citing Banham 1990 p.218. Also Banham 1999 p.190.

represents mixed burnt food waste, with the black mustard seeds having been gathered for medicinal purposes or for culinary use as a flavouring agent.[319]

A similarly anomalous sample is <HAM18-20> from Harston Mill, probably of Early Saxon date, whose charred seeds are dominated by cleavers (*Galium* cf. *aparine* L.; 68.4% of 136 seeds). Although normally interpreted as an arable weed, cleavers produces edible parts and could also have had medicinal applications.[320] The burred fruits are, however, notoriously adhesive, such that the seeds' entry to the settlement could have been entirely accidental.

An interesting problem is posed by soft brome and rye brome, which are not easily distinguished on the basis of seed morphology and which have therefore been treated here as a single amalgamated category (*Bromus hordeaceus/secalinus* L.). Many indeterminate *Bromus* records are also likely to represent *B. hordeaceus*/*secalinus*, since alternative species of *Bromus* are lacking from the charred dataset. In 1990, Banham noted that brome seeds were often found in association with cereal remains in Anglo-Saxon botanical assemblages, and cautiously raised the possibility that brome grasses may have been deliberately exploited, as demonstrated for some periods of prehistory.[321]

Similarly, in the charred dataset compiled for this project, seeds of *Bromus hordeaceus/secalinus* (including indeterminate *Bromus*) are unusually ubiquitous for a non-cereal taxon, occurring in 45 assemblages (40.5%) and 130 samples (17.7%). They are also relatively common in the Mid Saxon sub-assemblage from Lyminge: present in six of the ten samples, and abundant (>100 seeds) in three.[322] However, given that *Bromus hordeaceus/secalinus* seeds are grain mimics and therefore likely to remain with harvested crops whether or not they are desired, the argument for deliberate exploitation can be made only tentatively. Nevertheless, <FOR1>

[319] Banham 2003 p.126 finds no textual evidence for the culinary use of spices *per se*.
[320] O'Brien (in press), ch.5; Launert 1981, p.176.
[321] Banham 1990 p.35. See *e.g.* Behre 2008 p.70 for prehistoric brome consumption.
[322] Appendix 3.

from Forbury House is particularly notable for its 262 indeterminate *Bromus* seeds, constituting 32.1% of the charred macrofossils, a proportion only exceeded by barley which may, as noted above, include a rare instance of two-row barley.[323] <FOR1> is also notable for its two lentils, another rare taxon which, as noted above, could perhaps have been a fodder crop.[324] It could thus be conjectured that <FOR1> may represent a burnt fodder store, comprising brome and two-row barley with traces of lentil and other pulses.

Evidence for other possible edible or medicinal species in the charred dataset is severely restricted; their macrofossils typically occur with extremely low frequency and abundance. Examples include, but are not limited to:

- a tentatively identified onion tuber (cf. *Allium* L.) in <LW7>, Lake End Road;
- a tentatively identified burdock seed (cf. *Arctium* L.) in <MMB1>, Brettenham;
- 20 seeds of beet (*Beta vulgaris* L.) in <IPS12> and two fruit lids of the same in <IPS7>; also one seed in each of <LYM05> and <LYM24> at Lyminge;
- nine seeds of hemlock (*Conium maculatum* L.) in the Stonea Grange assemblage;
- one seed of pignut (*Conopodium majus* (Gouan) Loret) in each of <LLC3> and <LLC14>, Cottenham;
- one seed of carrot (*Daucus carota* L.) in <Y47>, Yarnton; and
- one tentatively identified parsnip seed (cf. *Pastinaca sativa* L.) in <ENB1> , Eynesbury .

In addition, there are many occurrences of reed and rush species, notably the common reed (*Phragmites australis* (Cav.) Trin. Ex Steud.), whose fragmentary culm occurs in nine charred samples at Brandon. These and other less striking instances may represent the deliberate

[323] See above, §6.3.1.
[324] See above, §6.3.2.

gathering of such material, but there are no clear indications of direct management for this purpose.[325]

Sporadic findings such as those listed above can contribute little to current knowledge of Anglo-Saxon agriculture and wider plant-use. It is entirely plausible that a great many of the wild species recorded in the dataset were well-known in Anglo-Saxon cuisine and medicine, and that on occasion these plants were utilized and perhaps cultivated, but they are unlikely to have been routinely charred, and so archaeological evidence is perforce limited. It *is* notable, however, that many of these occurrences tend to be of Mid Saxon date – likewise the rare possible cultivars discussed above. The increased representation of several of these usable taxa in Mid Saxon charred deposits does not *necessarily* prove that the exploitation of those species intensified in the 8th-9th centuries. It is possible that the generally greater abundance of charred plant macrofossils from this period has resulted in a richer, and therefore potentially more representative, spectrum of plants being preserved.[326] The fact remains, however, that the rare possible crops identified in Mid Saxon samples – hemp, hop, grape and poppy – are so far completely absent from the Early Saxon archaeobotanical record.

6.3.5 Non-arable taxa

Certain woody perennials, although classified as non-arable taxa, may nonetheless have been exploited for food, whether through arboriculture or gathering from the wild. Of these species, the most common is hazel (*Corylus avellana* L.), the fragmented nutshells of which occur in 43 assemblages (38.7%) and 131 samples (17.8%). Although hazelnut remains are sometimes quantified, the fragmentary nature of the material renders detailed quantitative analysis inappropriate.

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[325] *Cf.* below §6.4.6.
[326] See below, §6.5.

Several woody species bearing edible fruits are represented in the charred dataset, but with low frequency and abundance: *e.g.* fruiting brambles (*Rubus fruticosus* L. agg.), raspberry (*Rubus idaeus* L.), and varieties of cherry, plum and bullace (*Prunus* L.). Elder (*Sambucus nigra* L.) is comparatively well represented. It could have been exploited as a dye plant, and/or its berries might have been harvested as a foodstuff: seeds occur in 11 assemblages (9.9%) and 24 samples (3.3%), with a particular concentration (six samples) at Brandon.

Overall, as with the wild species discussed in the preceding section, evidence for the exploitation of woody perennials is severely limited in the charred macrofossil record. There is little to suggest that stands of fruit trees were deliberately maintained or systematically exploited, but such evidence would not, in any case, lend itself well to preservation by charring.[327]

[327] *Cf.* waterlogged and mineralized evidence: below, §§8.2–8.3.

6.4 Crop dominance and processing

This section establishes that the charred dataset is dominated by cereal remains, with free-threshing cereals dominating the crop component of most samples. It then attempts a functional interpretation of individual samples in terms of crop processing stages. These analyses and arguments aim to organize and categorize the charred data, prior to the investigation of chronological developments in crop husbandry that follow in subsequent sections. This section also includes some consideration of samples of atypical composition.

6.4.1 Dominant crop types

In accordance with the predicted biases, cereals constitute the predominant taxonomic grouping in the charred dataset.[328] Cereal remains are present in all charred assemblages, except for the negligible Mid Saxon assemblage from Wicken Bonhunt which contains only a single seed of *Atriplex patula* L. Cereal remains are also present in all but 31 of the charred samples. These 31 samples are all numerically insufficient (<30 items), and therefore the absence of cereals is likely to be due to chance, since the probability of any taxon occurring is reduced as sample size decreases.

Among the majority of assemblages and samples which contain cereal remains, indeterminate cereals constitute one of the most common taxonomic categories (Figure 6.7). Among those identified to genus- or species-level, the most widespread are wheats (*Triticum* L.) and barleys (*Hordeum* L.).

[328] Green 1982 p.43.

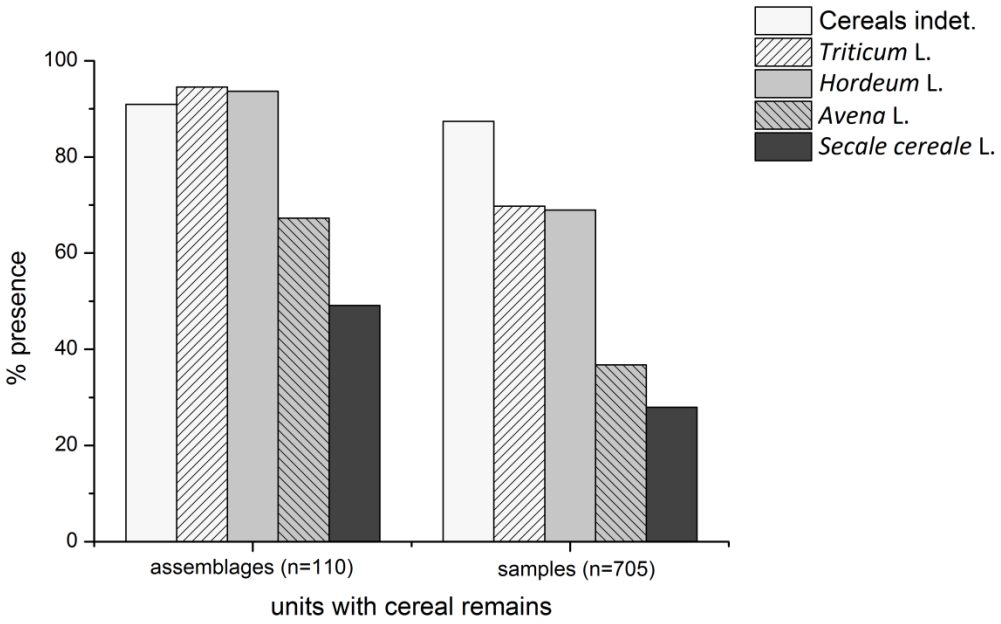


Figure 6.7 – Presence of cereal types, among assemblages and samples which contain *any* cereal remains.

Following the criteria set out above,[329] dominant crop types have been determined for 148 samples with ≥30 standard crop items identified to genus or species level (Figure 6.8). Two are dominated by flax (*Linum usitatissimum* L.), three by glume wheats (*Triticum spelta* L., where identifiable), and 126 by one or more of the free-threshing cereals: barley, rye, free-threshing wheat and oat. 17 samples do not have a clearly dominant crop type according to the criteria adopted here, although free-threshing cereals are typically the best represented category in these 'mixed crop type' samples.

[329] §3.9.3.

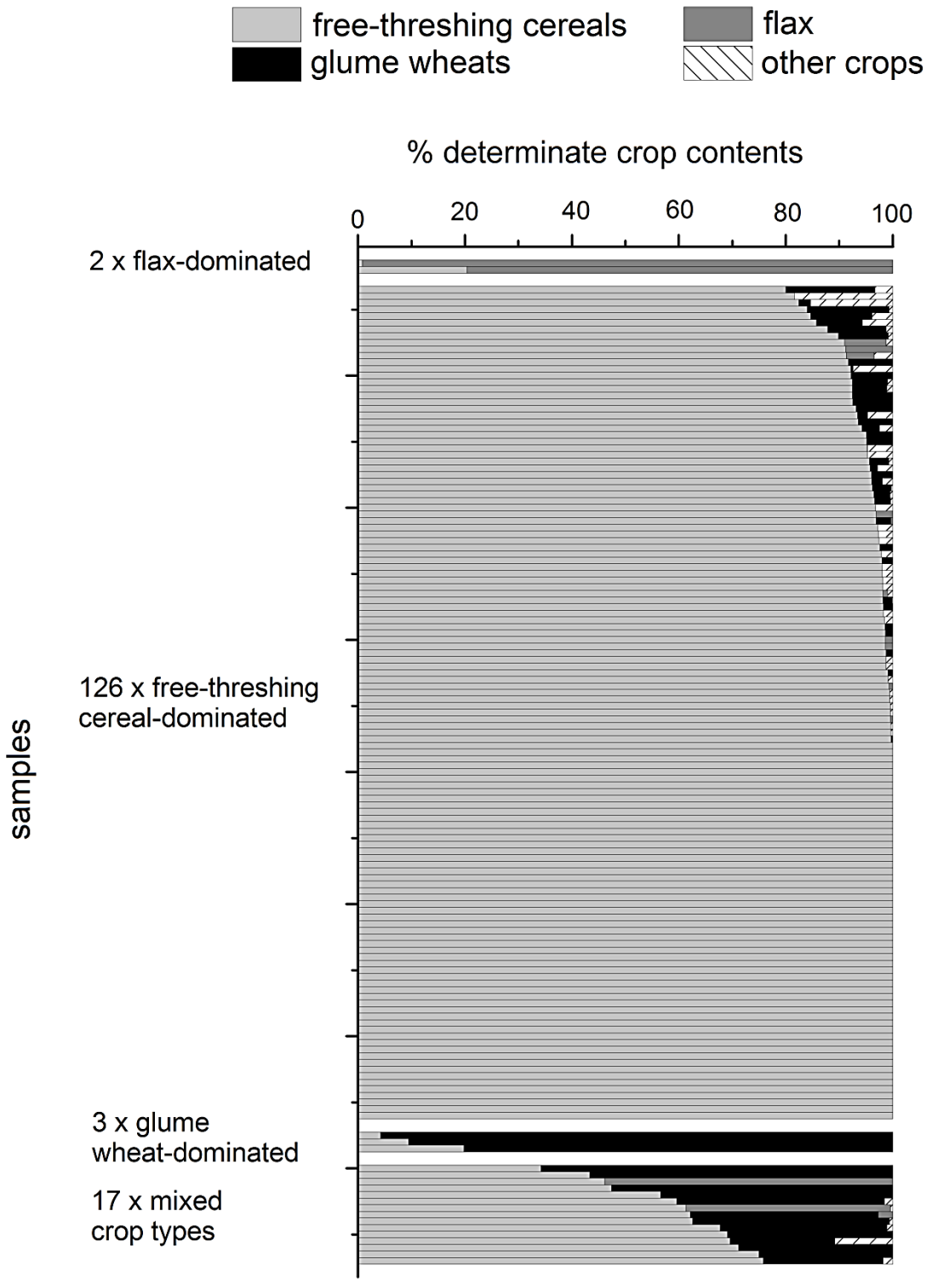


Figure 6.8 – Dominant crop types in charred samples.

6.4.2 Functional interpretation of flax samples

The crops remains in <BRT3> and <SMB16> are dominated by flax. In <BRT3> from Brandon Road North, flax seeds constitute less than 50% of the quantified macrofossil content and occur alongside cereals and weed seeds; it may be that it represents mixed charred waste from a variety of processing activities.[330] By contrast, <SMB16> from the waterfront area at Brandon contains over 3,000 flax seeds and over 100 capsule segments which, following Murphy's interpretation, could represent flax-processing waste used as fuel in the nearby hearths/kilns.[331]

One further sample, the Mid Saxon <LE2> from Lake End Road, is dominated by charred capsule tips of flax, which were estimated to constitute *c.*90% of the sample matrix. The mineral-encrusted nature of the deposit precluded full quantification; the sample was therefore omitted from the quantitative analysis of crop dominance above. Pelling suggests that the deposit may represent the by-products of flax beating or rippling – *i.e.* early stages in the flax-processing sequence – subsequently burnt as fuel.[332] The flax processing sequence is discussed in greater detail in Chapter 8.[333]

6.4.3 Functional interpretation of glume wheat samples

The crop remains in <AL1>, <SMB1> and <BRT4> are dominated by glume wheats (spelt wheat, where identifiable). Given the degree of dominance of glume wheats in these samples, the grains and glume bases of indeterminate cereals and wheats have been counted as glume wheats for the purposes of the following calculations.

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[330] Fryer in Atkins & Connor 2010 p.105. Discriminant analysis of weed seed types places <BRT3> in the 'FSBP' zone (graph not shown).
[331] Murphy & Fryer 2009 p.13.
[332] Pelling in Foreman *et al.* 2002 (CD-ROM).
[333] See below, §8.2.3.

The crop content of these samples suggests that they do not represent cleaned grain products, since all three have a relatively high ratio of glume bases to grains (Table 6.3). More than half of the spelt grains in <AL1> showed signs of having germinated.

Table 6.3 – Relative proportions of grain and glume bases in the glume wheat-dominated samples.

sample	% glume base	% grain	total grain + glume bases
<AL1>	66.8	33.2	663
<SMB1>	87.2	12.8	658
<BRT4>	58.5	41.5	318

These samples are all eligible for discriminant analysis of weed seed types, the results of which are not, in this instance, greatly altered by the treatment of *Avena* caryopses, whether as cereal grains or weed seeds. According to the discriminant analysis, <SMB1> and <BRT4> are likely to represent the by-products of fine sieving, while <AL1> is likely to represent the by-product of coarse-sieving (Table 6.4, Figure 6.9).

The results of these two approaches (crop content and discriminant analysis) can be reconciled as follows. The 'small, free, heavy' seeds and very high ratio of glume bases to grain in <SMB1> are both consistent with this sample representing a fine-sieving by-product. Sample <BRT4>, by contrast, could represent spikelets charred prior to sieving: hence the discriminant classification roughly in between the FSP and FSBP groups, and the roughly equal proportions of grains and glume bases (some of the latter preserved as spikelet forks). Spikelets could conceivably have been burned whilst being parched for dehusking (although, in this instance, whole spikelets do not seem to have been preserved intact).[334] Finally, Pelling suggests that <AL1> represents a mixture of different processing by-products, including 'cumins': the by-product of rubbing parched and malted grains, as represented chiefly by glume bases and germinated grains.[335]

[334] van der Veen 1989 p.304.
[335] Pelling in Booth *et al.* 2001 p.422.

Table 6.4 – Results of discriminant analysis of glume wheat-dominated samples.

	oat as crop		oat as weed	
sample	predicted class	probability (2 d.p.)	predicted class	probability (2 d.p.)
<AL1>	CWBP	0.79	CWBP	0.74
<SMB1>	FSBP	0.99	FSBP	0.99
<BRT4>	FSBP	0.78	FSP	0.51

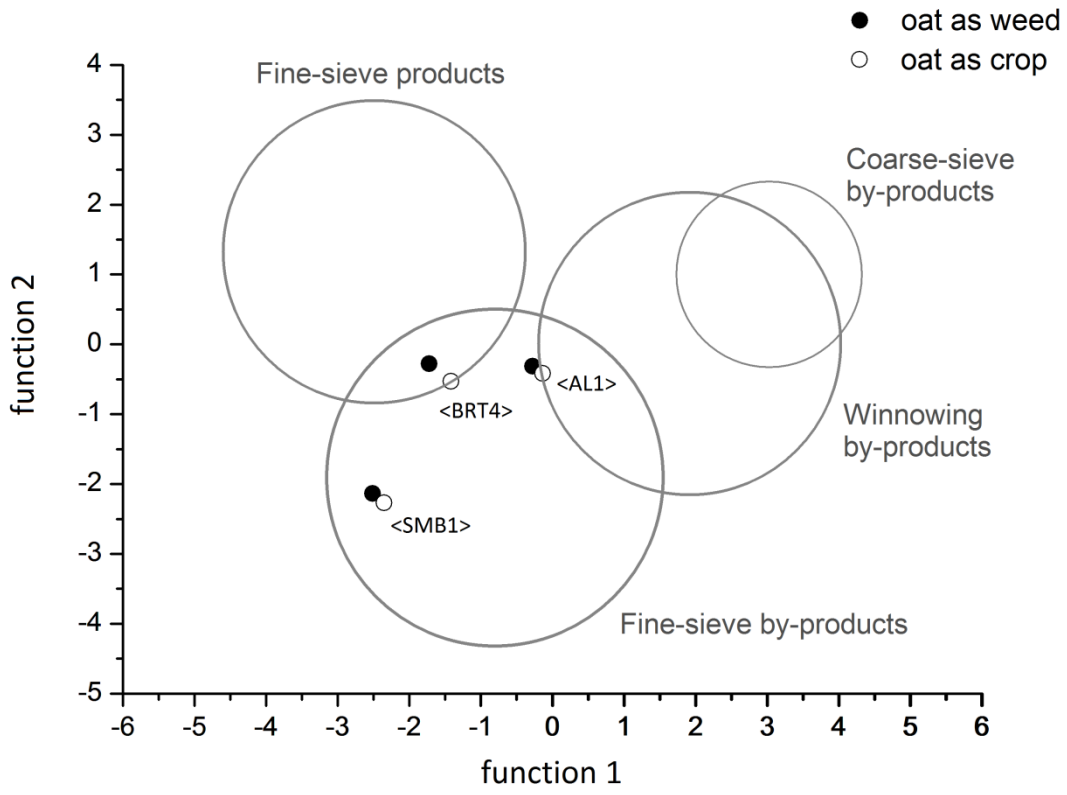


Figure 6.9 – Discriminant analysis scatterplot of glume wheat samples, with and without oats.

6.4.4 Functional interpretation of free-threshing cereal (FTC) samples

All of the 126 samples whose crop component is dominated by free-threshing cereals are eligible for the ratio method of crop processing analysis. 99 of the samples are eligible for the discriminant analysis of weed seed types, although 11 of those are ineligible if *Avena* caryopses are treated as cereal grains rather than weed seeds. Where the results achieved by these two independent methods are mutually consistent for a given sample, it can be argued strongly that the crop and weed contents of that sample 'belong together', *i.e.* that such a sample could theoretically represent a single product or by-product from the processing sequence.[336] In total, compatible results were obtained for 57 of the 126 samples (Table 6.5; Figures 6.10–6.13). In most cases, the compatibility of results did not greatly depend upon the treatment of *Avena* caryopses as cereal grains or weed seeds. The majority of samples were classified as products (FSP or USG), rather than by-products.

Table 6.5 – Compatibility of ratio and discriminant analysis results for FTC samples, highlighting mutually compatible cases.

		Ratio analysis classifications			
		CWBP	FSBP	USG	FSP
Discriminant analysis classifications	CWBP	1			
	FSBP		3	12	
	FSP			13	28

Such a tendency towards grain-rich products, rather than chaff-rich by-products, is to be expected among samples dominated by free-threshing cereals, because of both the relative fragility of their rachis segments (which disintegrate more quickly than glumes when being charred) and also the nature of their processing sequence: rachis and straw are removed in the early processing stages, which may more often occur outdoors or in barns than in settlement contexts in close proximity to fire. The glume bases of glume wheats, by contrast, are removed at

[336] Bogaard 2011 p.151.

a later stage, and often on a day-to-day basis within settlements/households, where they are more likely to be brought into contact with fire and so preserved through charring.[337]

It is interesting to observe that the majority of samples with 'incompatible' results are either very rich in grain (>80%) or relatively rich (6-30%) in rachis; in discriminant analysis, these samples fall mostly within the 'FSBP' zone (Figures 6.12-6.13). Some of these samples, especially those rich in grain, lack compatible results simply because they contain too few classifiable weed seeds to support discriminant analysis. The other samples, typically characterised by 'small, free, heavy' weed seeds and relatively high quantities of rachis, could well represent admixtures of different by-products. In any case, they cannot be strongly associated with any single processing stage.

[337] Boardman & Jones 1990 pp.5–6; G. Jones 1987 pp.321–2; see also below, §6.5.3.

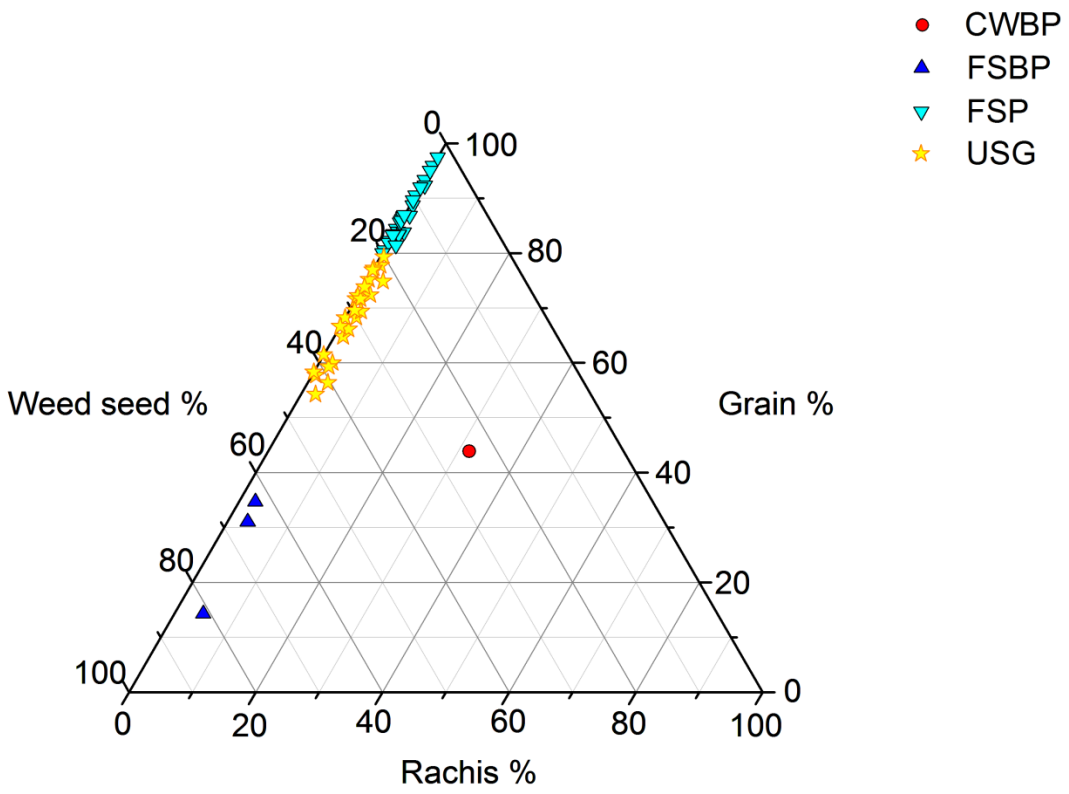


Figure 6.10 – Ratio analysis triplot of FTC samples with compatible crop processing classifications.

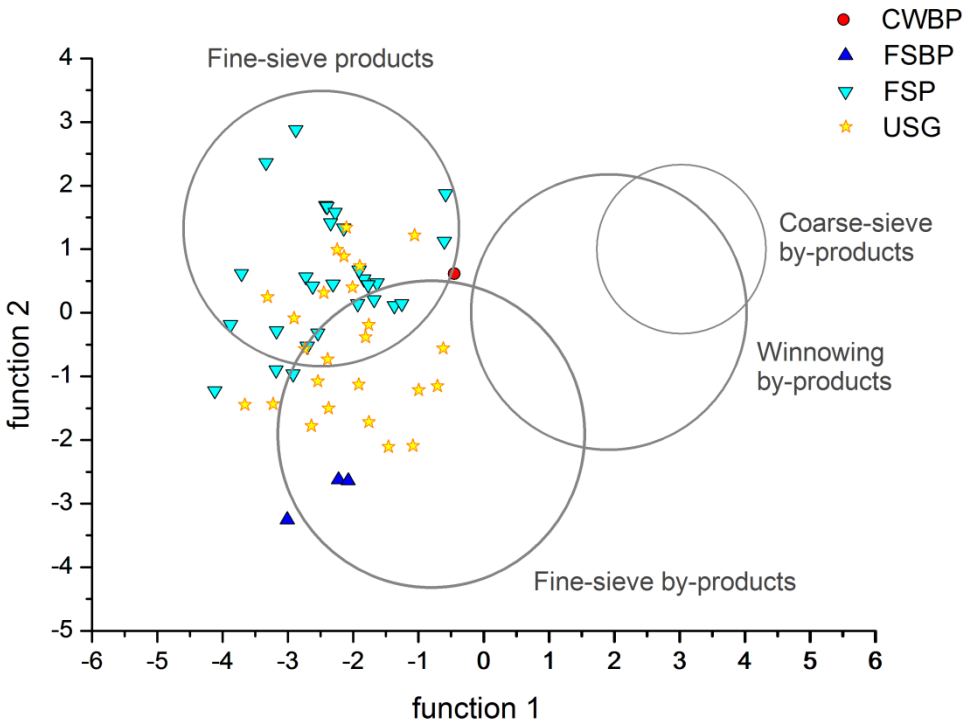


Figure 6.11 – Discriminant analysis scatterplot of FTC samples with compatible crop processing classifications.

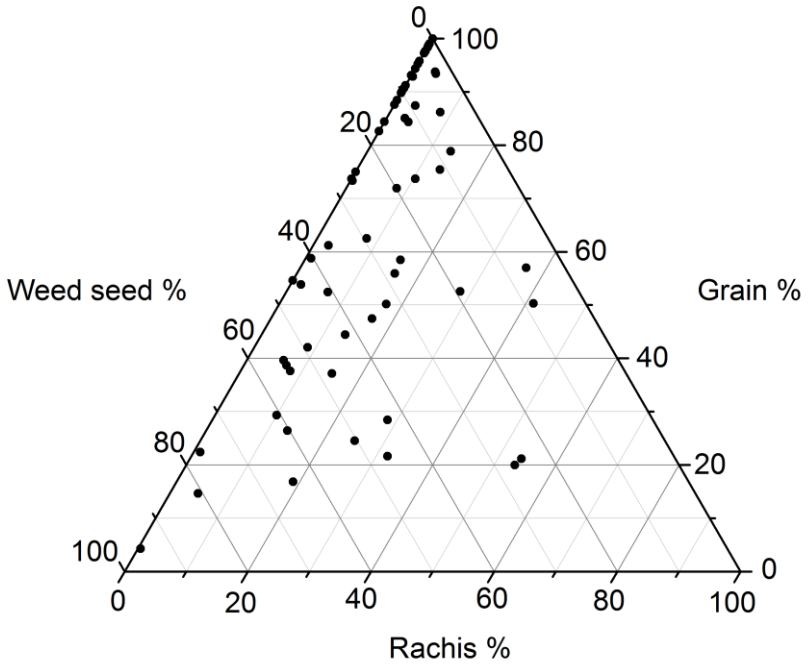


Figure 6.12 – Ratio analysis triplot of FTC samples *without* compatible crop processing classifications.

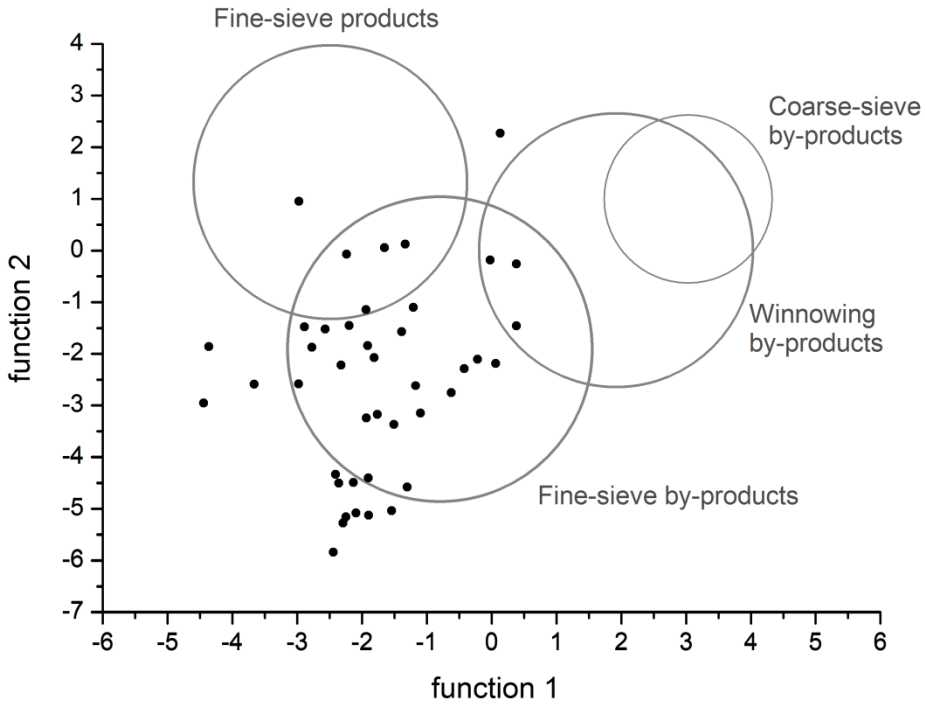


Figure 6.13 – Discriminant analysis scatterplot of FTC samples *without* compatible crop processing classifications.

6.4.5 Functional interpretation of mixed crop type samples

17 samples are not clearly dominated by any single crop type, although free-threshing cereals tend to be the best-represented category in most of these samples (above, Figure 6.8). Two samples, <LH3> from Lot's Hole and <SMB11> from Brandon, have crop components jointly dominated by free-threshing cereals and flax. The few additional weed seeds in <LH3> produce a discriminant analysis classification of FSP; it is possible that the sample represents mixed burned waste from different food preparation activities, including roasted flax seeds, cereal grains, and associated crop-mimic weed seeds. <SMB11>, meanwhile, is an exceptionally dense sample with varied charred plant remains including flax seeds, free-threshing cereal grain and rachis, grist (ground-up malted grain), wild/weed seeds, and bracken and heather which might have been gathered for use as animal bedding.[338] The most abundant individual taxon in the sample is field pepperwort (*Lepidium campestre* (L) W.T. Aiton), which could conceivably have been gathered for culinary use as a peppery flavouring, but might equally be an accidental contaminant, *e.g.* as a ruderal plant growing near the source of fire.[339] The mixed nature of the sample, which apparently combines evidence of flax, malt, bedding and probable contaminants, precludes any single, definitive interpretation.

The crop contents of the remaining 15 samples are jointly dominated by free-threshing cereals and glume wheats (Table 6.6). Seven of these are from Harston Mill, and are all clearly dominated by cereal grain, thus probably all representing cleaned products. <CSE2> from Chiefs Street in Ely and <Y25> from Yarnton could be similarly interpreted. The three samples from Lake End Road contain unusually high proportions of rachis and glume bases, plus occasional oat floret bases and cereal-size culm nodes, but are dominated by weed seeds; they could therefore be interpreted as unprocessed harvests burnt whilst being dried, with free-threshing cereals and

[338] Murphy & Fryer 2009 p.12; *cf.* Gardiner 2012 p.24.
[339] Launert 1981 p.30.

glume wheats having been at least stored together, if not also grown together. A similar interpretation is possible for the less abundant <ENB2> from Eynesbury and possibly <Y4> from Yarnton. <WST1> from West Stow is dominated by possible weed seeds and can be seen as a fine sieved by-product, an interpretation supported by its discriminant analysis classification.

Table 6.6 – Simplified botanical contents of mixed crop type samples
(PR denotes grain counts to which indeterminate cereal grains have been proportionally reassigned, hence the hypothetical fractions of grains listed; DA denotes discriminant analysis of weed seed types).

	free-threshing cereals		glume wheats		total	weed	
sample	grain (PR)	rachis	grain (PR)	glume base	grain	seeds	DA class
<CSE2>	87.7	-	39.3	-	127	11	-
<ENB2>	131.1	6	21.9	4	153	110	FSBP
<HAM2>	339.0	-	221.0	-	560	2	-
<HAM26>	616.9	-	182.1	-	799	30	FSBP
<HAM3>	55.5	-	18.5	-	74	3	-
<HAM32>	205.8	-	121.2	-	327	55	FSBP
<HAM36>	97.1	-	126.9	-	224	6	-
<HAM4>	95.1	-	182.9	-	278	17	-
<HAM6-7>	215.5	-	99.5	-	315	16	FSBP
<LW2-3>	349.3	131	46.7	200	396	806	FSBP
<LW4>	480.3	484	132.7	145	613	1,583	FSBP
<LW7>	247.1	99	35.9	56	283	1,020	FSBP
<WST1>	219.0	5	-	61	219	1,800	FSBP
<Y25>	263.2	-	83.8	19	247	21	FSBP
<Y4>	30.7	-	1.3	12	32	30	FSBP

6.4.6 Atypical samples

Two Mid Saxon samples of extremely high density, <Y47> from Yarnton (1007.7 items per litre) and <LYM24> from Lyminge (477.9 items per litre), are notable for containing unusually high proportions of straw. Culm nodes and internodes occur in small quantities throughout the charred dataset, often in a fragmentary state, but there are rarely more than ten nodes per sample. Culm is relatively fragile, especially that of free-threshing cereals, and its scarcity in the

charred dataset is therefore unsurprising.[340] However, in <Y47> there are 40 culm nodes and 66 internodes, and in <LYM24> there are 215 nodes and 262 internode fragments. While these quantities are small when compared with the total abundance of these samples (20,153 and 14,336 standard items respectively), they are unusually high in comparison with most other samples. In the published report for Yarnton, two alternative interpretations are suggested for <Y47>: that it represents unthreshed cereals burnt as sheaves, or that it represents destruction debris including thatching straw from a nearby building.[341] The sheaf interpretation is here thought to be the more economical explanation, since it fully accounts for the co-occurrence of culm and large quantities of charred grain and weed seeds within the same deposit, whereas grain has been found in modern experiments to survive poorly in burnt thatching straw, perhaps in part because of decay prior to charring (although, conversely, smoke-blackened thatch could have offered good preservation conditions).[342] In the same way, it is possible to interpret <LYM24> as representing burnt sheaves. The wider interpretative value of this argument is considered in relation to structural evidence in Chapter 7.[343]

Uniquely in the charred dataset, Mid Saxon sample <WLP5> from Walpole St Andrew was dominated by Poaceae culm nodes (88 out of 117 items, 75.2%). Given the low quantity of cereal remains from this sample (12 grains and one rachis node of barley), it could be argued that it is unlikely to represent burnt sheaves, but rather straw used in some other way – such as thatching, bedding or matting – and charred along with a few other contaminants.

Heather and reed remains are notable occurrences in a few samples. In both <SH2> and <SH4> from Lechlade (of Intermediate date), *Juncus* (Rush) is the single best represented taxon amongst the charred seeds; in <SH4> it is overwhelmingly dominant (57.3% of 593 seeds), and

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[340] Boardman & Jones 1990 p.6.
[341] Hey 2004 pp.149, 361.
[342] Campbell in Tipper 2012 pp.108–109; *cf.* de Moulins 2007.
[343] See below, §7.2.3.

indeterminate stem fragments in these samples might also be those of *Juncus*.[344] Both samples derive from the same SFB, and each contains too few crop items for the determination of a dominant crop type. It is possible that thatching, matting, or bedding material is represented.

Juncus capsules, meanwhile, are quantified only in <WLP4> (10 capsules) and <WLP10> (28 capsules) from Walpole St Andrew, both of Mid Saxon date. The capsules occur in these samples alongside relatively high proportions of rachis, culm nodes, and seeds of wetland taxa, and it is possible that they represent reeds gathered and perhaps mixed with cereal processing waste for use as bedding or fodder.

Finally, <SMB3> and <SMB10> from Mid Saxon Brandon are notable for containing relatively large quantities of *Calluna* (heather) capsules besides cereal grains and other seeds; in <SMB10> they dominate the quantified items in the sample (64.6% of 82 items). Such deposits could be interpreted as a mixture of burnt cereal stores with heather matting.

[344] Stevens in Bateman *et al.* 2003 p.79.

6.5 Chronological patterns: scales of production and processing

The dataset reveals a general increase in charred botanical material between the Early and Mid Saxon periods. In brief, the Mid Saxon period is characterized by more assemblages, more samples, higher frequencies of samples per assemblage, higher abundances of plant macrofossils per sample, and higher average densities of plant macrofossils per sample, than either the Early Saxon or Intermediate period. This section examines these patterns in more detail, and considers their implications with regard to the question of whether or not the scale – or centralization – of agricultural production and processing increased in the Mid Saxon period. The distinction between large-scale and centralized crop processing is important, but unlikely to be recognizable in the archaeobotanical record.

6.5.1 Assemblages and samples

Most assemblages and samples can be assigned to either the Early or the Mid Saxon period; fewer are deemed to be Intermediate or Generic in date, and only Stonea Grange and Childerley Gate produced Sub-Roman material (Figures 6.14–6.15). A substantial proportion of the Early Saxon samples are those from Flixton and Eye whose data, as mentioned above, are available only in semi-quantitative (presence/absence) form. If only samples with fully quantified items are considered, then comparatively few (16.4%) can be assigned to the Early Saxon period, whereas 25% are Intermediate, and nearly 50% are Mid Saxon (Figure 6.16). More specifically, the frequency of quantified samples per assemblage displays a general increase over time (Figure 6.17). Three Mid Saxon assemblages exhibit a particularly high frequency of samples, partly because of the large scale of the excavations from which they derive, and partly because of the wide extent of the sampling strategy and high quality of preservation: Yarnton (23 samples), Ipswich (35 samples), and Brandon (48 samples).

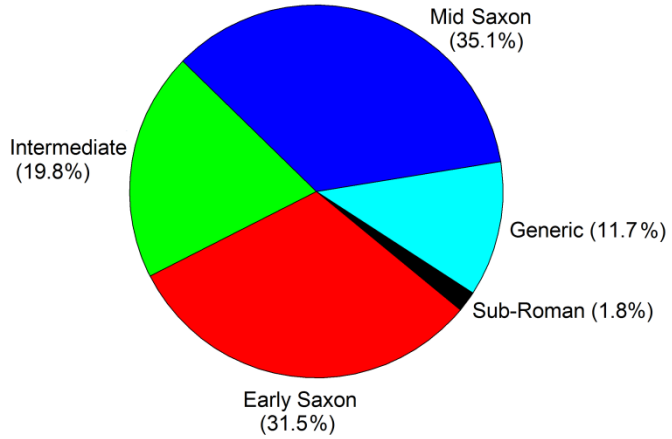


Figure 6.14 - Chronological distribution of charred assemblages (n = 111).

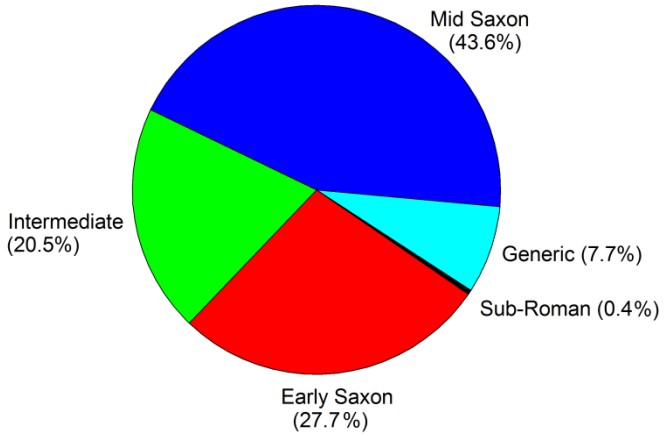


Figure 6.15 - Chronological distribution of charred samples (n = 736).

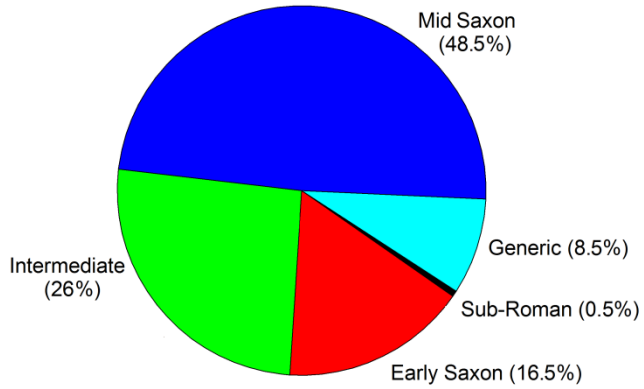


Figure 6.16 - Chronological distribution of fully quantified charred samples (n = 577).

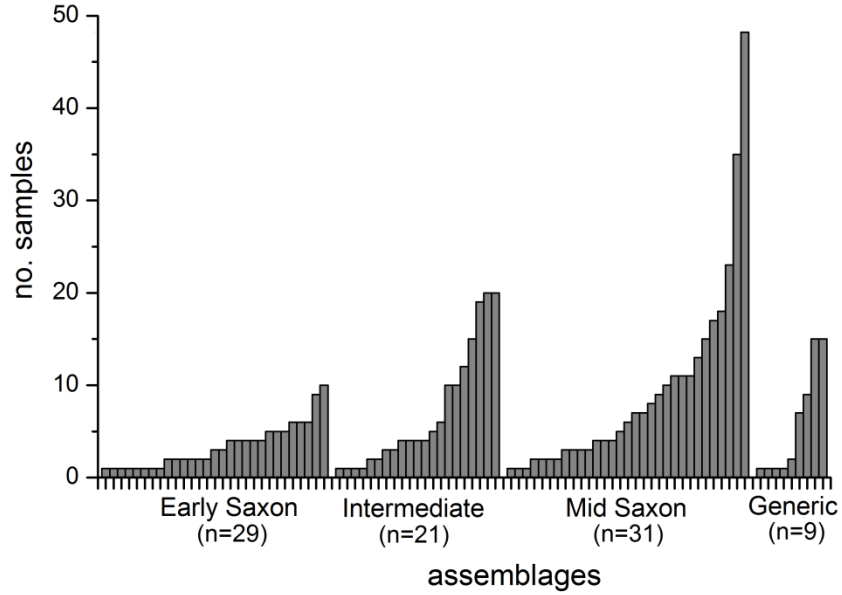


Figure 6.17 – Frequency of fully quantified charred samples per assemblage, grouped chronologically.

A comparatively low frequency of samples is thus apparently symptomatic of Early Saxon assemblages. Only three Early Saxon assemblages contain more than ten samples each: Handford Road (11 samples), Flixton (30), and Eye (59). At the time of writing, the botanical data for these assemblages are available only as semi-quantitative assessments. Such assessments, as advised by English Heritage, are intended to review *all* samples in an assemblage in order to identify those which may justify fully quantitative analysis. Hence, assessments are inherently broader and less critical in their coverage than are fully quantitative analyses, which generally exclude samples deemed not to deserve further work (*e.g.* because of very low density).[345] It is notable that, in her assessments of the Handford Road, Flixton and Eye assemblages, Fryer judged few if any of the samples to be worthy of further analysis.[346] The apparent high frequency of samples in these assemblages is therefore misleading: it does not necessarily reflect high concentrations of charred plant remains. By contrast, the five Intermediate and ten Mid Saxon assemblages that each contain more than ten samples have all been analysed in a fully quantitative fashion. The

[345] Campbell *et al.* 2011 pp.7–8. For this policy in practice, see *e.g.* Pelling in Foreman *et al.* 2002(CD-ROM).
[346] Fryer in Boulter 2005 p.96; Fryer in Boulter 2008 p.226; Fryer 2008 p.4.

implication seems to be that Intermediate and especially Mid Saxon assemblages are often found to contain more samples worthy of full analysis than their Early Saxon counterparts – *i.e.* that Intermediate and Mid Saxon samples tend more often to be richer in charred plant remains. This inference is borne out by the following analyses of abundance and average density.

6.5.2 Abundance and density of charred macrofossils in samples

As outlined in Chapter 3, the following quantitative analyses have been restricted to samples deemed to be numerically sufficient, *i.e.* with ≥30 selected standard items.[347] In this way, 245 of the 577 samples with fully quantified items are deemed to be numerically sufficient. With the exception of the few samples whose atypical contents have been considered above,[348] little information has been lost by excluding non-standard parts from these calculations.

It may first be observed that the most abundant samples (≥500 standard items) are most frequently of Mid Saxon date (Figure 6.18), including two exceptionally abundant Mid Saxon samples which have been omitted from the diagram so as not to obscure the main patterns: <Y47> from Yarnton (20,153 items) and <SMB16> from Brandon (4,746 items). Such measures of abundance do not, however, take account of differences in the volume of soil from which the macrofossils derive. Hence, a more meaningful comparative measure is that of average density.

[347] §3.9.1.
[348] §6.4.6.

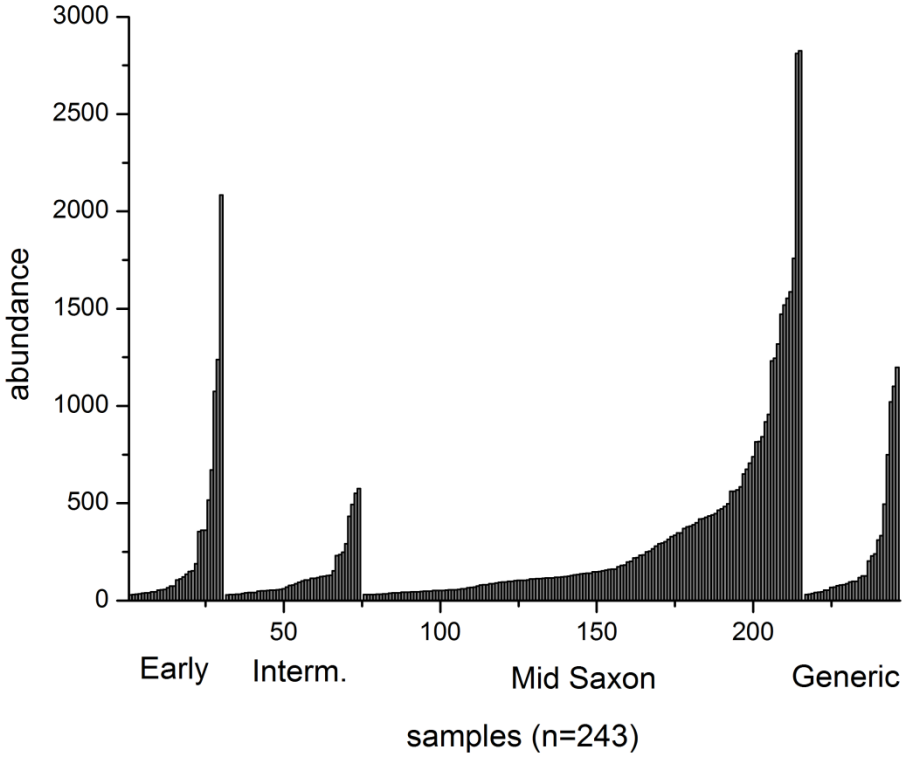


Figure 6.18 - Abundance of numerically sufficient charred samples, grouped chronologically (excluding <SMB16> and <Y47>).

It is possible to calculate the average density of plant remains for 463 of the 577 samples with fully quantified items. For the remaining samples, the soil volume in litres could not be ascertained. Average density ranges from less than one to >1,000 items per litre. The highest average densities were shown by <SMB11> from Brandon (1,012.67 items per litre) and <Y47> from Yarnton (1,007.7). These two extreme cases are excluded from Figure 6.19, so as not to obscure patterns among the other samples. To facilitate comparison with Figure 6.18, numerically insufficient samples (<30 standard items) are also excluded from Figure 6.19. The remaining distribution pattern reveals a general tendency towards high density in the Mid Saxon period. Three samples of Early Saxon and Intermediate date show unusually high densities, with >60 items per litre, but these are all chronologically ambiguous: <SMB1> from Brandon, <AL1> from Alchester, and <WIL20> from Wilton Autos.[349]

[349] See above, §6.2.4.

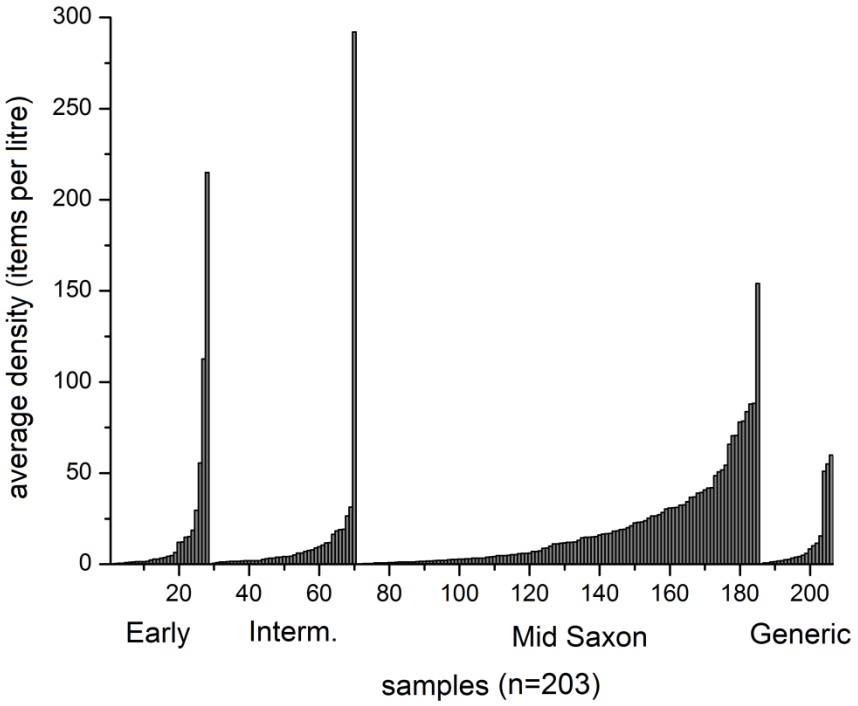


Figure 6.19 – Average density of charred samples grouped chronlogically (excluding <SMB11> and <Y47>).

6.5.3 Discussion

Can these trends towards increasing abundance and density of charred plant remains necessarily be taken to represent a genuine historical phenomenon, and, if so, how should the patterns be interpreted? The many and varied potential biases affecting preservation and recovery mean that a direct and simple relationship between absolute quantities of plant remains and past agrarian economies cannot necessarily be assumed.[350] A more nuanced interpretation is required.

It might be contended that the observed trends are an artefact of sampling strategies: that the study of certain Mid Saxon sites has benefited from the retrieval of more, and larger, samples. However, as already noted, some Early Saxon sites such as Eye *have* been subject to extensive

[350] Dennell 1976a pp.230–234.

sampling strategies, but few of the resultant samples have been deemed worthy of analysis.[351] In addition, since the measure of average density is calibrated by soil volume, the observed trends cannot be due simply to greater volumes of soil being taken from Mid Saxon contexts.

It might alternatively be contended, with particular regard to East Anglia, that the existence of Ipswich Ware as a diagnostic 8th-9th century pottery type renders material of that period more easily identifiable and datable, hence the apparent growth in material for that period. However, even if Mid Saxon activity *per se* is easier to identify, this would not necessarily account for the greater abundance and average density of plant macrofossils *within* the individual samples of this period. Rather, it would seem that 5th-6th century charred plant remains are genuinely scarcer than their 8th-9th century counterparts, just as Early Saxon settlements often appear more ephemeral and transient than those of the Mid Saxon period. Intermediate material is typically comparable to that of the Early Saxon period in terms of abundance and density, although the frequency of Intermediate samples per assemblage shows some increase upon Early Saxon levels.

How, then, might the trends be interpreted? Could the apparent increase in charred plant remains be due to an increasing scale of production and/or greater centralization of processing, perhaps beginning around the 7th century? Alternatively, could the patterns be related to changes in depositional practices?

According to Tipper, most refuse in Early Saxon rural settlements was ultimately redeposited in the backfills of SFBs, having first accumulated in middens. From the Mid Saxon period onwards, pits are increasingly in evidence (although rubbish pits *sensu stricto* remain rare).[352] This general narrative sequence of refuse deposition is exemplified by the charred samples. For the Early Saxon period, more than 50% of samples derive from SFBs.[353] This

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[351] See above, §6.5.1.
[352] Tipper 2004 pp.157–159; *cf.* Hamerow 2012 p.94.
[353] For most samples, as far as could be ascertained, the fills of SFBs (rather than their floors) are meant.

proportion declines steeply, progressively, in the Intermediate and Mid Saxon samples, while growing proportions of samples derive from ditches, the miscellaneous 'other' features and, to a lesser extent, pits (Figures 6.20–6.23). The increase in ditch-derived samples clearly parallels the growing ubiquity of ditched features which characterizes Anglo-Saxon settlements from the 7th century onwards.[354] The pits, meanwhile, are of varied form, but none is closely comparable to the form of grain storage pit familiar from the Iron Age.[355] The single best represented context type in the 'other' category is the anthropogenic palaeosol at Mid Saxon Brandon, from which 34 grid square samples derive. 24 Mid Saxon samples from Ipswich, which also belong to the 'other' category, are likely to derive from either pits or ditches.

[354] See above, §1.2.
[355] Cunliffe 2005 pp.411–413.

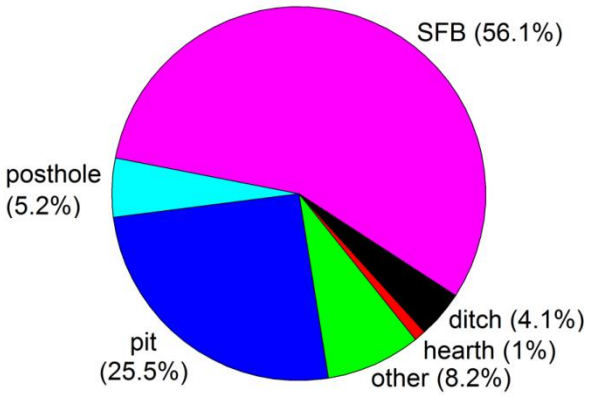


Figure 6.20 – Distribution of fully quantified Early Saxon samples by feature type (n = 98).

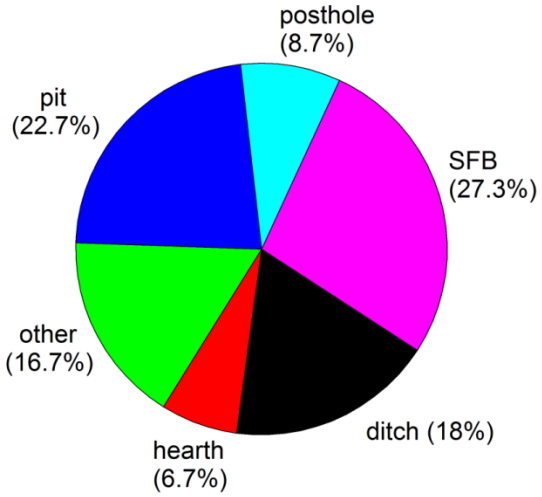


Figure 6.21 – Distribution of fully quantified Intermediate samples by feature type (n = 150).

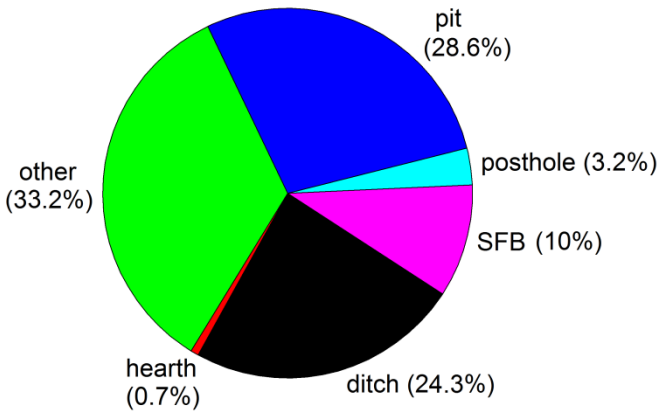


Figure 6.22 – Distribution of fully quantified Mid Saxon samples by feature type (n = 280).

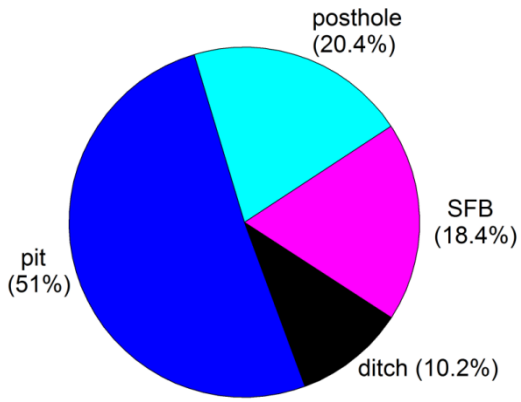


Figure 6.23 – Distribution of fully quantified Generic samples by feature type (n = 49).

There is some correlation between feature type and average density. Samples from SFBs are typically of low average density; only the Mid Saxon <PL3> marginally exceeds 30 items per litre. Most samples of relatively high density (≥30 items per litre) derive from pits and, to a lesser extent, ditches, besides tending also to be of Mid Saxon date (Figure 6.24).

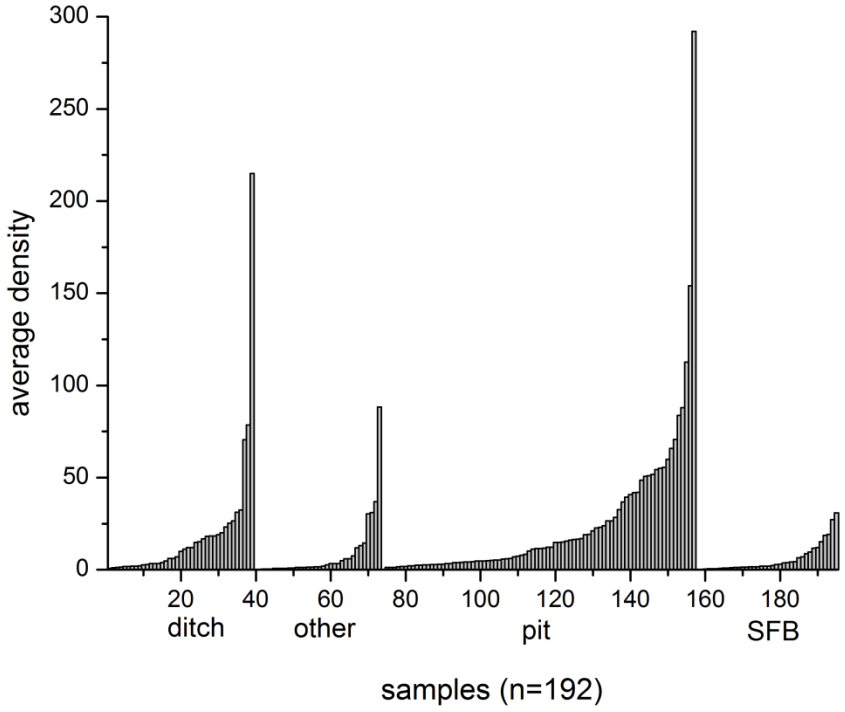


Figure 6.24 – Average density of numerically sufficient charred samples, representing predominant feature types; excluding <SMB11> and <Y47>.

Broadly, then, among Early Saxon samples there is a dual tendency towards (i) frequent deposition in SFB backfills and (ii) a lower average density of plant remains. Among the Mid Saxon samples, there is an opposite trend towards (i) higher average density of plant remains and (ii) more frequent deposition in ditches. These two simultaneous developments – an increase in average density and a shift in dominant feature type – may be causally linked. If SFB backfills usually represent secondary or even tertiary deposition, as Tipper suggests, then one might well expect the charred plant remains therein to be of low average density, since any dense concentrations originally present in the primary deposits are likely to have been disturbed and diluted during redeposition.[356] Conversely, the high-density samples from Mid Saxon pits and ditches are arguably more likely to represent single, relatively rapid depositional events, such as batches of accidentally or deliberately burnt grain being promptly disposed of in a ditch or pit, thus producing dense concentrations of charred plant remains.[357]

It would seem that such dense deposits are far more prevalent from the 8th century onwards, both in absolute terms and as a proportion of the entire dataset for the period. Arguably, the most straightforward interpretation of this development is that more material was being produced, processed and therefore burned in the Mid Saxon period; and/or more material was being processed and stored in centralized facilities. This interpretation would accord with the slight evidence for the emergence of new, larger storage and processing facilities at around the same time.[358]

This argument is a variation upon that proposed by van der Veen and G. Jones, who argue that large, grain-rich deposits in southern Britain in the Iron Age are an indication of 'large-scale

[356] Tipper 2004 pp.157–159. *Cf.* Bogaard 2011 p.85 for a similar argument relating to Neolithic ditches.
[357] van der Veen 2007 p.987, Table 6.
[358] See below, §7.2.

production and/or consumption'.[359] In the historical context of the Iron Age, when glume wheats generally predominated over free-threshing wheats, the specific emphasis upon *grain*-rich deposits is central to the argument. Van der Veen and Jones argue that deposits rich in chaff or weed seeds would result from routine, everyday cleaning of cereals regardless of the scale of activity, whereas *grain*-rich deposits would result primarily from accidental conflagrations (*e.g.* during storage or drying), which are theoretically more likely to occur where grain is being handled on a larger scale: more grain-handling resulting in more accidental charring. However, as established above, the Early/Mid Saxon charred dataset is dominated by free-threshing cereals and, consequently, grain-rich samples are common throughout the entire period without necessarily indicating surplus production on a large scale.[360] Rather, it is the *frequency* of such samples in Mid Saxon assemblages, and the high average densities of macrofossils in those samples, that are here considered indicative of large-scale and/or centralized production.

Nonetheless, the evidence cited above does not necessarily preclude the possibility that dense concentrations of charred grain were created prior to the 8th century, but were ultimately disposed of in such a fashion that defies archaeological recognition, *e.g.* in dumps that were subsequently reworked into cultivation plots, or as tertiary deposits in SFB backfills. However, it is striking that there are only three Early Saxon samples in the entire charred dataset with an average density exceeding 30 items per litre. Two of these, <AL1> and <SMB1> are anomalous because of their abundance of spelt glume bases; they are highly atypical and, as argued below, may better be considered as traces of a 'Very Late Roman' (post-AD 410) phase of southern British agriculture.[361] The third sample, <CRM3> from the Criminology Site, is more typical in that it is dominated by free-threshing cereal grains, and derives from the fill of an ovoid pit which

[359] van der Veen & Jones 2006 p.223.
[360] Because free-threshing cereals are inherently less likely to be preserved as chaff-rich samples: see above, §6.4.4.
[361] See below, §6.6.1.

displayed traces of burning, including burnt stones. It may conceivably represent a batch of cereals accidentally charred whilst being dried over a hearth, represented by the ovoid pit; if so, it would appear to be a unique example for this period.[362]

To summarize, there are exceptionally few samples of high density which can be dated to before the 8th century, to the extent that such samples may provisionally be considered to be, largely, a new phenomenon of the 8th-9th centuries, potentially indicative of large-scale or centralized production and/or processing. It is instructive here to note that, among the 28 Mid Saxon samples with an average density of >30, four sites are particularly well-represented: the Hutchison Site (five samples), Lake End Road (four), the Ashwell Site at Ely (three), and Yarnton (five).[363] Four of the ten Mid Saxon samples studied from Lyminge are also of high density, all four deriving from pits (Table 6.7). Apart from the exceptionally dense <SMB11> and <Y47>, <LYM30> and <LYM24> have the highest densities of any Mid Saxon charred samples studied in this project.

Table 6.7 – High density charred samples from Lyminge.

sample	average density
<LYM05>	31.8
<LYM24>	477.9
<LYM30>	160.1
<LYM53>	49.3

These 'high density' Mid Saxon sites exhibit other notable characteristics, such as high status and/or ecclesiastical associations (reflected by *e.g.* imported goods), a relatively high frequency of samples per assemblage, and the occurrence of rare possible crops among the charred plant remains (*e.g.* opium poppy, glume wheats).[364] It may therefore be conjectured that the proposed increase in the scale or centralization of arable production and processing in the Mid Saxon period was particularly associated with high-status/ecclesiastical establishments.

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[362] Dodwell *et al.* 2004 pp.115, 119–120; see below, §7.3.3.
[363] The other sites, with one or two samples each, are Forbury House, Harston Mill, Lackford Bridge, Lot's Hole, Pennyland, Rosemary Lane, Brandon, Walpole St Andrew, and Ingleborough.
[364] See above, §6.3.

Conversely, Ipswich, despite being represented by 35 Mid Saxon charred samples obtained via a wide-ranging sampling strategy (including the targeted sampling of very dense charred deposits from other periods), failed to produce any with average densities exceeding six items per litre for the Mid Saxon period. While this could to some extent be due to the extremely high soil volumes extracted (often >100 litres), which could have incorporated relatively small but dense concentrations, it may be relevant that a similar tendency towards low density has also been observed among the Mid Saxon samples from *Lundenwic*.[365] One could conjecture that, as 'consumer' populations, the inhabitants of the two *emporia* were not processing crops in bulk, and hence not giving rise to the theoretical scenario in which dense concentrations of charred grain would be produced and deposited. Rather, agricultural produce could have been acquired, processed and consumed on a domestic scale within individual households.

[365] Davis in Malcolm *et al.* 2003 p.290; Davis in Cowie *et al.* 2012 p.300.

6.6 Chronological patterns: cereal crops

This section considers if and how the range and relative importance of the cereal crops cultivated changed between the Early and Mid Saxon periods, through a combination of semi-quantitative 'presence' analyses and fully quantitative analyses of relative abundance. Particular attention is paid to (i) the relationship between free-threshing and glume wheats, and (ii) the relationship between hulled barley and free-threshing wheat (*i.e.* the 'bread wheat thesis').

6.6.1 Glume wheats

As discussed above, there are two key issues relating to the role of glume wheats in Early and Mid Saxon England: the demise of spelt and the (re)introduction of emmer.[366] More generally, the popular perception that glume wheats are anomalous in Anglo-Saxon contexts requires critical attention. The charred dataset compiled for this project can provide an updated perspective on these related issues.

As determined above, only three samples in the dataset have a crop component dominated by glume wheats: <AL1>, <SMB1> and <BRT4>.[367] Presence analyses, however, suggest that glume wheats *per* se may not be as scarce in 5th-9th century contexts as is often assumed. For the Early Saxon period, free-threshing and glume wheats display near-equitable constancy, with both types occurring in more than 50% of assemblages and nearly 25% of samples. Unexpectedly, glume wheats show marginally *higher* presence values than free-threshing varieties for this early period. Among the Intermediate and Mid Saxon records, *i.e.* from around the 7th century onwards, there is a far greater disparity between free-threshing and glume wheats, as the free-threshing wheat remains increase sharply in ubiquity while those of glume wheats decline. Indeterminate *Triticum* maintains relatively high presence values throughout (Figures 6.25-6.26).

[366] See above, §2.3.
[367] See above, §6.4.1.

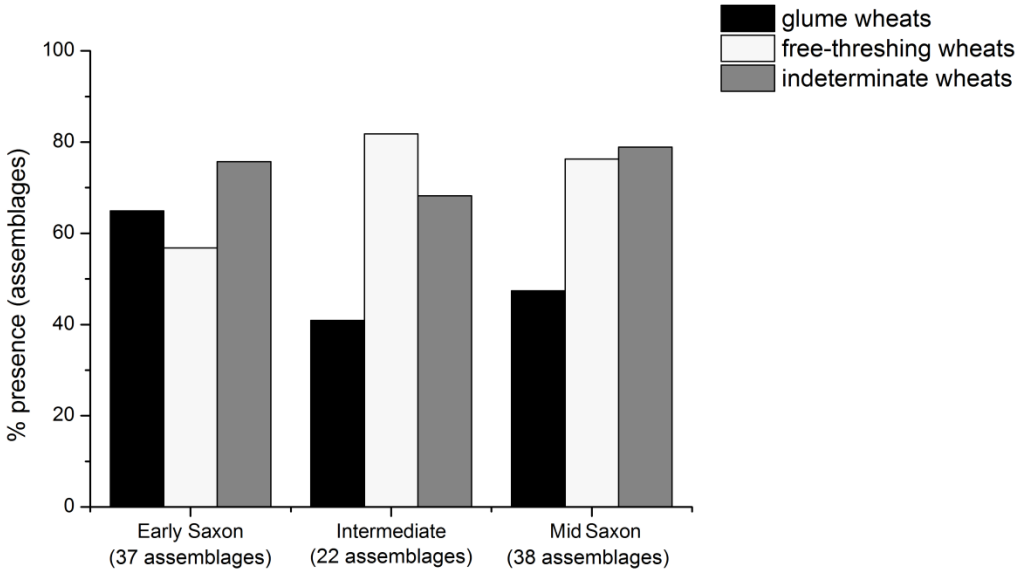


Figure 6.25 – Diachronic presence analysis of wheat types, among assemblages with cereal remains.

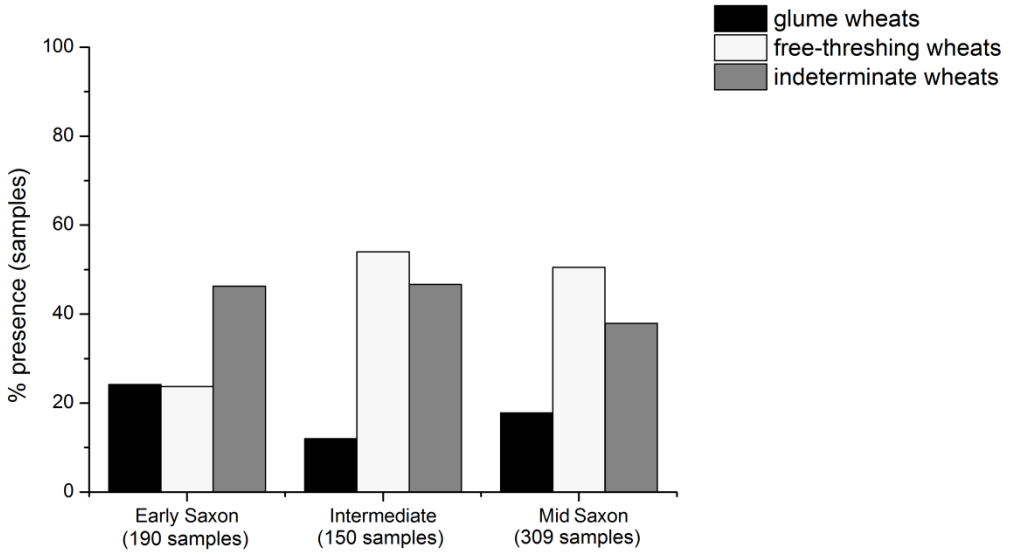


Figure 6.26 – Diachronic presence analysis of wheat types, among samples with cereal remains.

Examining the different glume wheat species in closer detail, it is possible to observe a net decline in the presence of spelt over time, and a small rise in emmer, although spelt maintains higher presence values than emmer throughout the period (Figures 6.27-6.28).

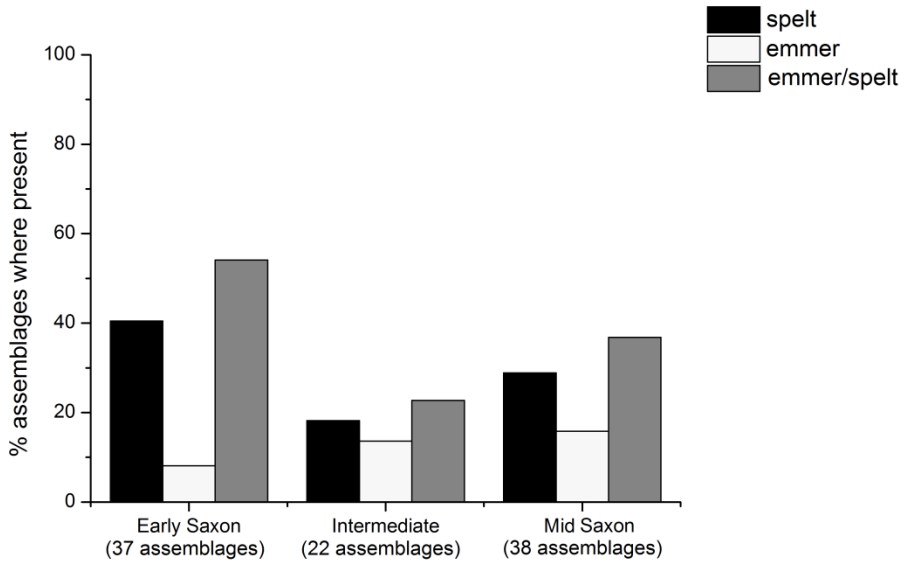


Figure 6.27 – Presence analysis of glume wheat species, among assemblages with cereal remains.

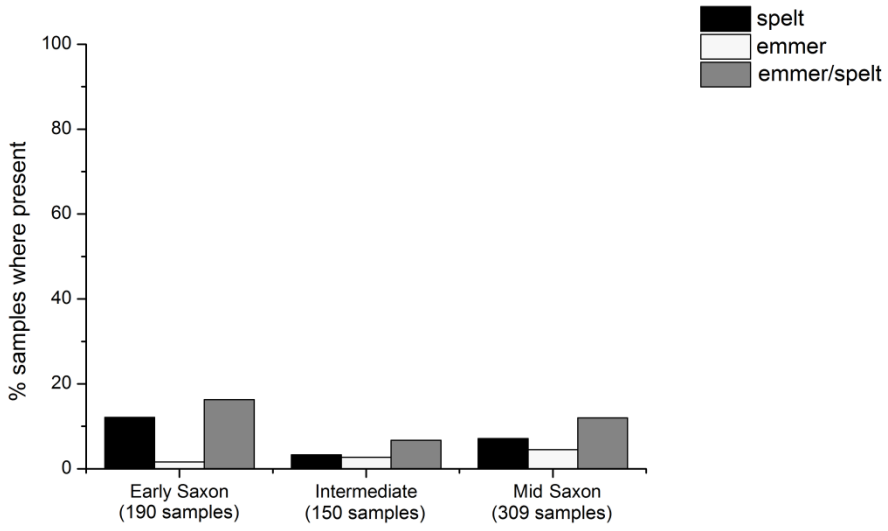


Figure 6.28 – Presence analysis of glume wheat species, among samples with cereal remains.

Considering only presence analyses, therefore, the transition from spelt to free-threshing wheat would appear to have been rather more protracted than is often assumed, with both types of wheat co-occurring in the study regions in the 5th-6th centuries, and free-threshing wheats achieving clear dominance only from the 7th century onwards. Over the same period there appears to have been a small rise in the presence of emmer, in keeping with Pelling and Robinson's model,[368] but this remains a persistently rare crop by comparison with spelt.

Some important caveats must, however, be borne in mind when considering these patterns. Firstly, a working assumption has been made that the recorded glume wheat remains are all of genuine 5th-9th century date, rather than representing residual Iron Age or Roman material. In fact, only those from Yarnton and Lake End Road have been radiocarbon dated to the Anglo-Saxon period, such that in most instances the possibility of residuality cannot be excluded. Conversely, however, it is *not* the case that glume wheats in Anglo-Saxon deposits frequently return Iron Age or Roman-period radiocarbon dates. Rather, there is a dearth of direct dates relating to *any* period. Residuality might be assumed *a priori* but can seldom be demonstrated empirically. In some instances, circumstantial evidence in fact tells against residuality. In the Mid Saxon sub-assemblage from Lyminge, for example, the charred spelt remains are not thought to represent earlier residual material: they are not in appreciably worse condition (*e.g.* more eroded or fragmented) than the free-threshing cereal remains, such as might be expected if they had been reworked into a later deposit.

Secondly, there is the considerable disparity between the assemblage-based and sample-based presence values for glume wheats, the former tending to be much higher than the latter: the implication is that, even where glume wheats do occur at Anglo-Saxon sites, they nonetheless tend to be relatively scarce among individual samples.

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[368] Pelling & Robinson 2000.

The presence analyses have clearly exaggerated the significance of glume wheat macrofossils which, in most samples, occur in very low quantities relative to other crop remains. These quantities are arguably too low to indicate deliberate cultivation, but may rather represent either residual pre-Saxon material or 'volunteer' crops persisting in former spelt fields now turned over to free-threshing cereals.[369] There are relatively few sites at which glume wheat macrofossils are found with such frequency and/or abundance as to suggest, with some plausibility, that deliberate cultivation took place. Alchester, Brandon, and Brandon Road North (Thetford) are notable for their spelt-dominated samples.[370] Several samples from Harston Mill (of Early, Mid Saxon and Generic date) contain notable quantities of spelt-type grain, some germinated, which are not considered by the analyst to be residual.[371] At Yarnton, the grains, glume bases and spikelets forks of emmer/spelt (emmer, where identifiable) were radiocarbon-dated to cal.AD 670-900 (at 95% confidence). At Lake End Road, glume wheat grain and chaff – again mostly emmer, where identifiable – were radiocarbon-dated to cal.AD 435-663 in one instance, but the other samples were associated with 8th-9th century pottery.[372] Glume wheat macrofossils also occur, but are relatively scarce, in the Mid Saxon assemblages from the Hutchison Site, Lyminge, and Ely (Chiefs St); and in the probably Early Saxon samples from Eynesbury and West Stow. Most of the glume wheat macrofossils in the Lyminge sub-assemblage derive from the dense sample <LYM24>, which may represent a burnt sheaf. Where identifiable, most glume wheat grains and glume bases in this sample are of spelt, although one spikelet fork is tentatively ascribed to emmer.[373] In addition, although not included in the core dataset because of a lack of detailed information, it is worth noting the charred remains from Dumbleton, Gloucester and Great Wakering. Spelt was the dominant cereal in 9th century deposits from Gloucester, while

[369] Murphy 1994 p.37.
[370] See above, §6.4.3.
[371] Scaife in O'Brien (in press).
[372] Pelling & Robinson 2000.
[373] Appendix 3.

'moderately high densities of spelt chaff' were recovered in the Mid Saxon assemblage from Great Wakering.[374] At Dumbleton the radiocarbon-dated (6th-10th century) remains are identified only as emmer/spelt.

Hence, there appear to be two patterns requiring explanation. First, there is the relatively widespread occurrence (but generally low abundance) of glume wheat macrofossils – especially spelt – in the 5th-6th centuries, falling sharply from the 7th century onwards. Second, there is the occurrence of sparse, localized concentrations of spelt, and occasionally emmer, at the few sites listed above, throughout the 5th-9th centuries.

It is suggested here that the spelt-dominated samples should be seen as reflecting Romano-British agricultural traditions continuing beyond the conventional cut-off date in the early 5th century.[375] A relatively poorly understood 'Very Late Roman' phase is thus postulated: a phase of agriculture revealed only where radiocarbon dates or artefactual associations indicate a post-AD 410 date, but potentially much more widespread. An abrupt transition from a spelt-dominated cropping regime to one dominated by free-threshing wheats in the early 5th century might in any case seem improbably risky as a farming strategy. The transition may rather have been more gradual, perhaps with free-threshing wheat introduced alongside spelt, in a maslin (*i.e.* mixed) crop. Although glume wheats would require separation from free-threshing cereals for processing purposes (at least for dehusking), there is no reason why they could not have been sown and perhaps stored together, thence entering the archaeobotanical record together.[376]

Such may be the case with the Harston Mill samples of Early, Mid Saxon and Generic date, for example, which could plausibly be interpreted as mixed grain products. Those from Lake End

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[374] On the Gloucester (Westgate) samples, which are not fully published see Green 1979 p.178; Green in Heighway *et al.* 1979 p.186. On Great Wakering, Fryer in Dale *et al.* 2010 p.219.
[375] Booth *et al.* 2007 pp.319–320.
[376] *Cf.* maslins of spelt and rye known from early modern Alsace (Slicher van Bath 1963 p.263).

Road, could perhaps represent unprocessed harvests of mixed crops.[377] Yet these and other similar instances (*e.g.* Brandon Road North) are of presumed *Mid Saxon* date, which suggests that, in some places, the transition to free-threshing wheats was not yet complete by the 8th-9th centuries. Localised Mid/Late Saxon concentrations of spelt still appear at Gloucester, Great Wakering, Brandon Road North and Harston Mill; and of emmer – perhaps an innovation of the period – at Yarnton and Lake End Road. It is possible that, at these sites, glume wheats continued to offer some advantage which was lacking in free-threshing wheats. One potential advantage afforded by emmer and spelt is their greater natural resistance to spoilage. They can be threshed and winnowed and yet, unlike free-threshing wheats, remain relatively protected in spikelet form. Hence, they may have been more desirable than free-threshing wheats if intended for longer-term storage and/or transportation, their spikelets being lighter and less bulky than sheaves, which would constitute the equivalent 'chaff-protected' form for free-threshing wheats. In the historical context of Mid Saxon England, such long-term storage and transportation might be thought consistent with the delivery of food rents: transported to a tribute collection centre and then stored until required for consumption by lords and retainers, whether as bread or beer.

It must be stressed that this model is entirely conjectural, with no direct archaeological or documentary support. Charred samples from the supposed royal tribute collection centre at Higham Ferrers (Northants) contained only very low proportions of glume wheat macrofossils.[378] Documented food rents, as discussed by Banham and Hagen, seem to exhibit a preference for wheat over barley, but apparently without differentiating between the various species and varieties.[379] Nonetheless, it is notable that of the Mid Saxon charred assemblages containing concentrations of glume wheat macrofossils (Great Wakering, Harston Mill, Hutchison Site, Yarnton, Lake End Road, Lyminge, Ely, Brandon Road North), several have high status and/or

[377] *Cf.* above, §6.4.5.
[378] Moffett in Hardy *et al.* 2007 pp.160–168.
[379] Hagen 2006 pp.30–33; Banham 2010 pp.176–179.

ecclesiastical associations, and some exhibit other unusual archaeobotanical characteristics such as samples of very high density and the occurrence of rare possible crop taxa (*e.g.* opium poppy). Hence, it could be tentatively argued that glume wheats form part of a nascent 'high status' archaeobotanical signature in the Mid Saxon period.

6.6.2 Free-threshing cereals

There are two main questions relating to free-threshing cereals, addressed in this section. First, did free-threshing wheat(s) replace barley as the predominant cereal crop in the Mid Saxon period, as in the 'bread wheat thesis' proposed by Banham and others?[380] Second, did rye and oat increase in importance as cereal crops in the Mid Saxon period?

It is frequently asserted that barley was the predominant cereal crop of the Early Saxon period, but that the Mid Saxon period witnessed a shift in favour of free-threshing wheat, which was thenceforth the predominant cereal crop. For reference, Figure 6.29 reproduces in graphic form Banham's presence analysis results for the Early and Mid Saxon periods, upon which the central premise of this 'bread wheat thesis' rests.[381] The equivalent data for the present writer's new charred dataset are presented in terms of assemblages and samples; the results for assemblages are methodologically most comparable to those for Banham's sites (Figures 6.30–6.31).

The indeterminate wheats in Figure 6.30–6.31 are most likely to represent poorly preserved free-threshing varieties: not only because the grains of free-threshing wheats are more prone than those of glume wheats to distortion (and therefore more likely to be rendered 'indeterminate') whilst being charred, but also because positively identified glume wheat macrofossils are generally far scarcer in the dataset as a whole than those of free-threshing wheats.[382]

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[380] See above, §2.3.
[381] I am grateful to Dr Banham for the permission to cite the results of her doctoral thesis.
[382] Boardman & Jones 1990 p.8; see above, §6.3.1.

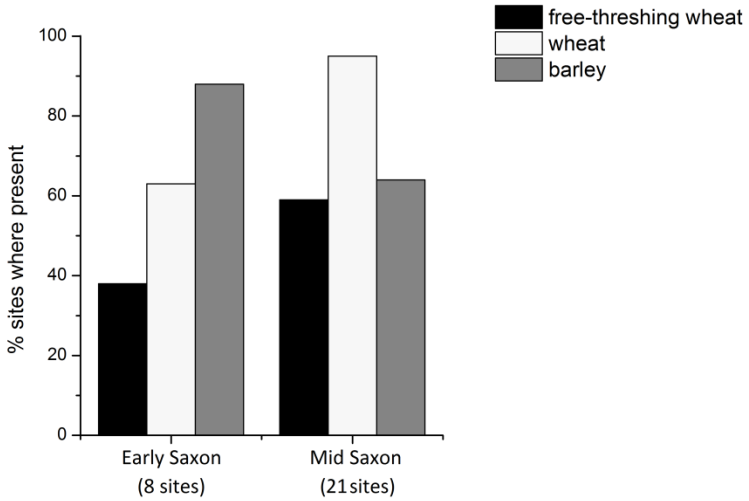


Figure 6.29 – Presence analysis of barley and wheat in Banham's dataset (data from Banham 2010 p.179, and 1990, p.38, by kind permission of the author).

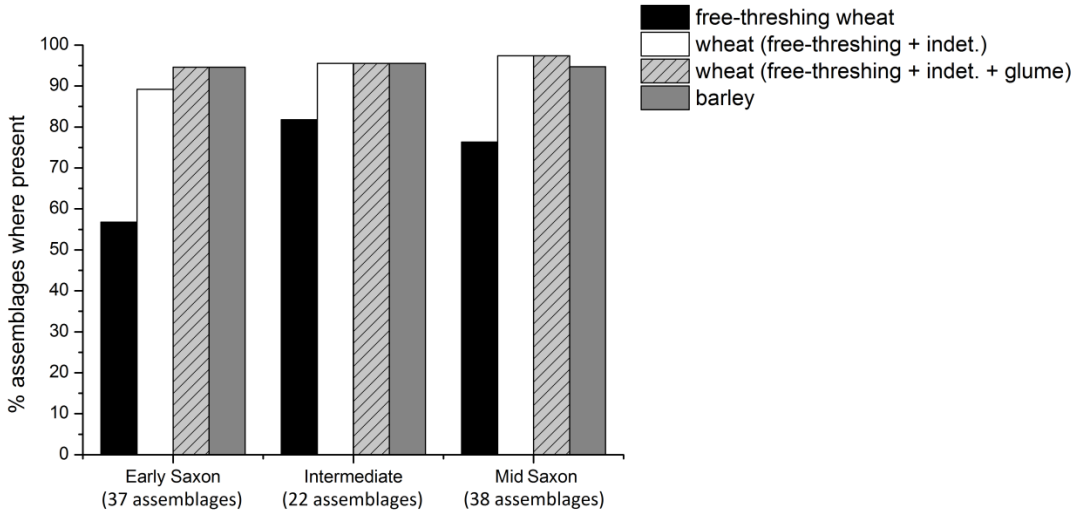


Figure 6.30 – Presence analysis of barley and wheat, among assemblages with cereal remains.

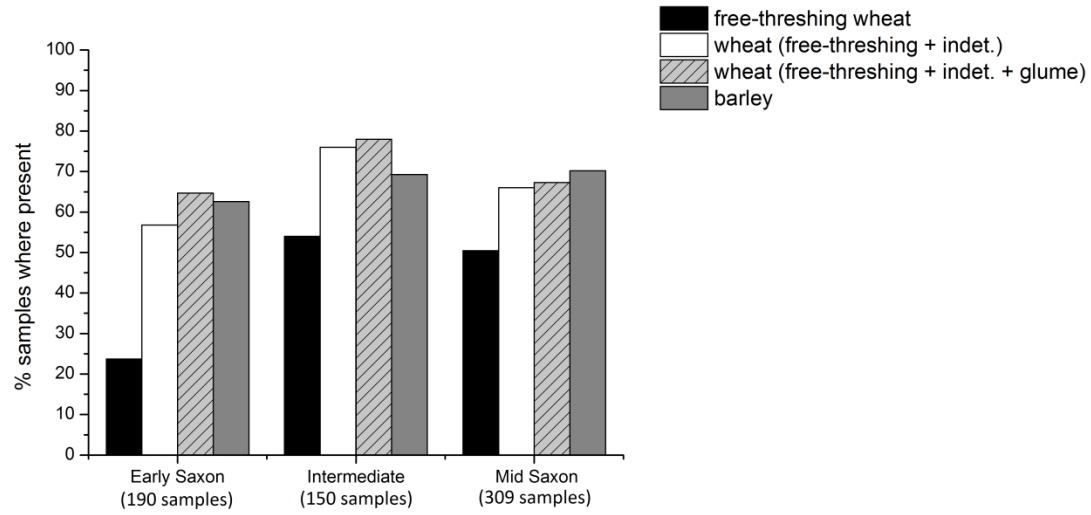


Figure 6.31 – Presence analysis of barley and wheat, among samples with cereal remains.

It can be observed that the strong patterns exhibited by Banham's results are not repeated in the new dataset, neither among assemblages nor among samples, except for the marked increase in the ubiquity of free-threshing wheat (*sensu stricto*) which appears to have occurred by the 7th century. Otherwise, wheat and barley display near-equitable constancy among assemblages throughout the period. Even by the most inclusive definition (*i.e.* including indeterminate and glume wheats), *Triticum* scarcely overtakes *Hordeum* in terms of presence in the Mid Saxon period. Such differences as do occur are small enough to be explicable by accidents of preservation/recovery. Likewise, the sample-based analysis reveals only slight differences between wheat (*sensu lato*) and barley. It does not suggest either that *Hordeum* was especially dominant in the Early Saxon period, or that *Triticum* had taken the dominant position by the Mid Saxon period. The greatest difference between the two crops occurs among Intermediate samples, with wheat (*sensu lato*) displaying higher ubiquity than barley, albeit by less than 10%. Overall, the general impression gained from the presence analyses is that barley and wheat were both near-ubiquitous crops throughout the 5th-9th centuries in the study regions, with little change in their respective importance over time.

However, it is possible that the presence values have masked important variations in the *quantities* of each crop. The relative proportions of wheat and barley macrofossils within samples could have changed over time such that, for instance, barley may tend to be numerically predominant in Early Saxon samples while wheat tends to be numerically predominant in Mid Saxon samples. The securest basis for such quantitative comparisons is to isolate a group of samples likely to represent a single stage in the processing sequence. In this case, the grain-rich products of free-threshing cereals (corresponding to USG and FSP: see above, §6.4.4) constitute an appropriate group for analysis, in which the relative proportions of wheat and barley can be calculated on the basis of quantified grains. Since these samples are dominated by free-threshing cereals (≥80%), all indeterminate '*Triticum* sp.' grains have been amalgamated with the positively-identified free-threshing wheat grains. The few remaining glume wheat grains, if any, have been

omitted. Only those samples which contain ≥30 grains of *Hordeum* and *Triticum* are considered eligible.

The disadvantage of these rigorous selection criteria is that they exclude many of the Early Saxon samples which, as already discussed, tend to be of relatively low abundance. A more inclusive version of the analysis has therefore been conducted, in which *all* samples dominated (≥80%) by free-threshing cereals are included, again with a quorum of 30 grains of *Hordeum* and *Triticum*, but regardless of presumed processing stage. There remains a strong bias towards the Mid Saxon period even in this more inclusive version.

The 'bread wheat thesis' might lead one to expect that many Mid Saxon samples ought to be characterized by high proportions of wheat relative to barley.[383] In fact, however, the samples display a full spectrum from wheat-rich to barley-rich, with a variety of proportions in between, both in the inclusive version (Figure 6.32) and in the more rigorous 'products only' version (Figure 6.33). In the tiny corpus of Early Saxon samples, by contrast, the relative proportions of wheat and barley tend to be closer to parity. Hence, there is no clear evidence to support the argument that free-threshing wheat increased in importance relative to barley in the Mid Saxon period.

[383] Although Banham does not suggest such a quantitative approach: Banham 1990 p.19.

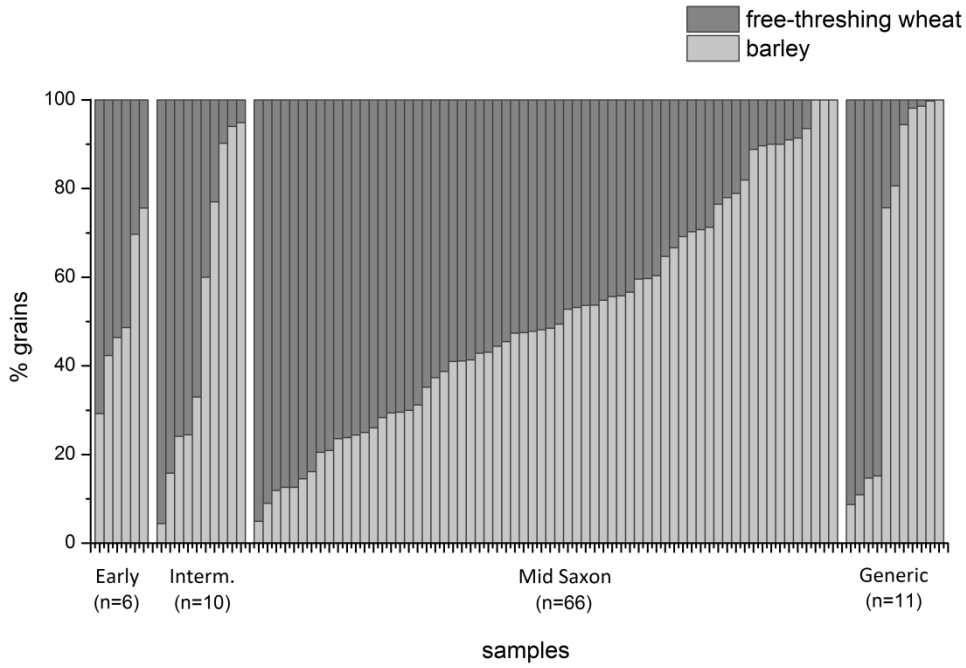


Figure 6.32 – Relative proportions of wheat and barley grains in free-threshing cereal samples (inclusive version).

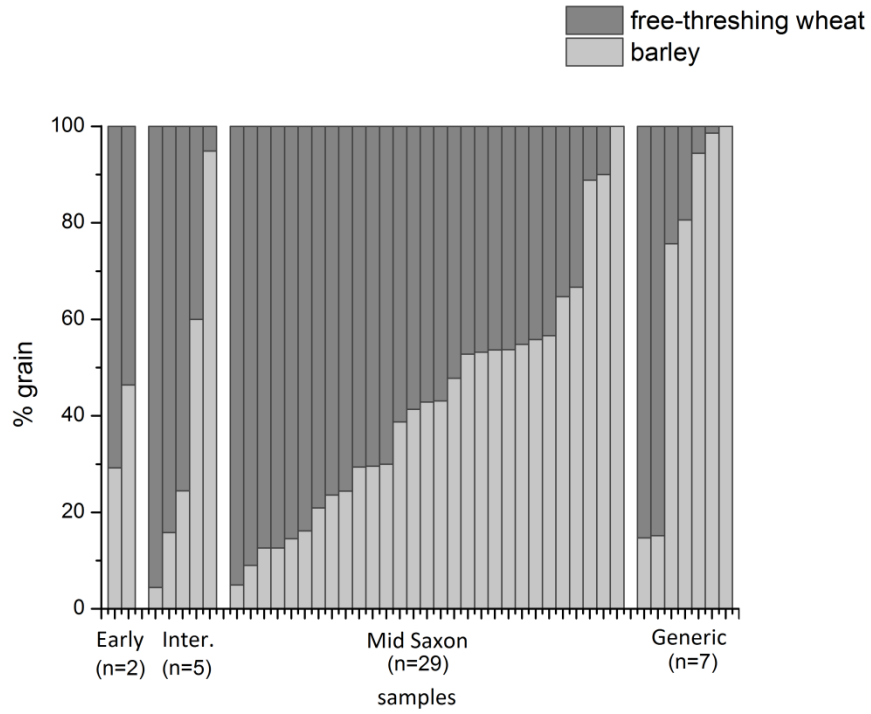


Figure 6.33 – Relative proportions of wheat and barley grains in free-threshing cereal samples (products only version).

However, direct comparisons of wheat and barley can provide only a partial picture of free-threshing cereal cultivation, since they do not account for rye and oat which, some scholars have suggested, became more important crops in the Mid Saxon period.[384] As before, it is useful to begin by comparing the results of Banham's presence analysis with those derived from the new charred dataset, making a working assumption that all indeterminate *Avena* macrofossils could represent cultivars (or, at least, tolerated arable contaminants). In Banham's study, the presence values of both rye and oat actually fall slightly between the Early and Mid Saxon periods (Figure 6.34); a rise in each crop is identified only in the Late Saxon period.[385] In the new charred dataset, however, there is a clear increase in the ubiquity of oats and especially rye between the Early and Mid Saxon periods, a trend which is exhibited among both assemblages and samples (Figure 6.35-6.36). The increase is even apparent in the Intermediate data, suggesting that developments could already have been underway by the 7th century. Nonetheless, even in the Mid Saxon period, the presence values of rye and oat still fall far below those for wheat and barley, which appear to have remained the principal cereal crops of the study regions. Oat and rye are far from being truly ubiquitous at any time in the 5th-9th centuries, but their increase in constancy now appears to have occurred considerably earlier than it did in 1990.

The quantitative analyses of free-threshing cereal grains in individual samples, now including rye and oat grains, produce complex results, but appear generally to reinforce the impressions gained from the presence analysis: the representation of oat and rye grains increases from the Early, through Intermediate, to Mid Saxon samples, in both the inclusive and more rigorous 'products only' versions (Figures 6.37-6.38).

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[384] See above, §2.3.
[385] Banham 1990 p.38.

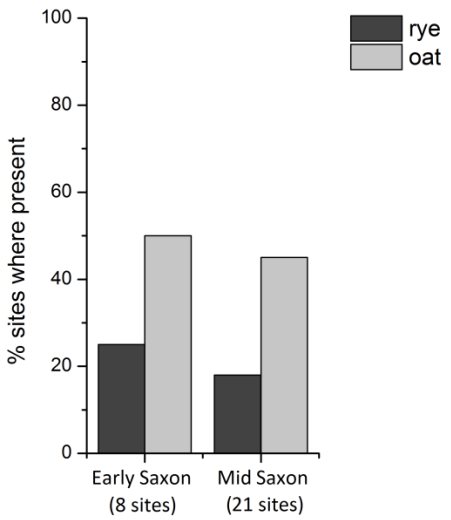


Figure 6.34 – Presence analysis of rye and oat in Banham's dataset (data from Banham 1990 p38, by kind permission of D. Banham).

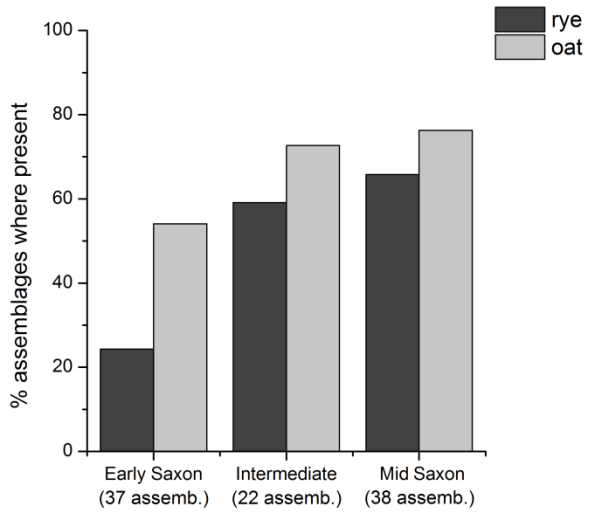


Figure 6.35 – Presence analysis of rye and oat, among assemblages with cereal remains.

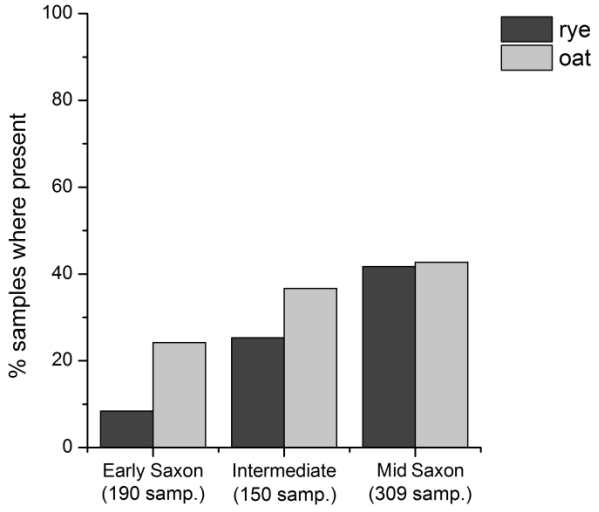


Figure 6.36 – Presence analysis of rye and oat, among samples with cereal remains.

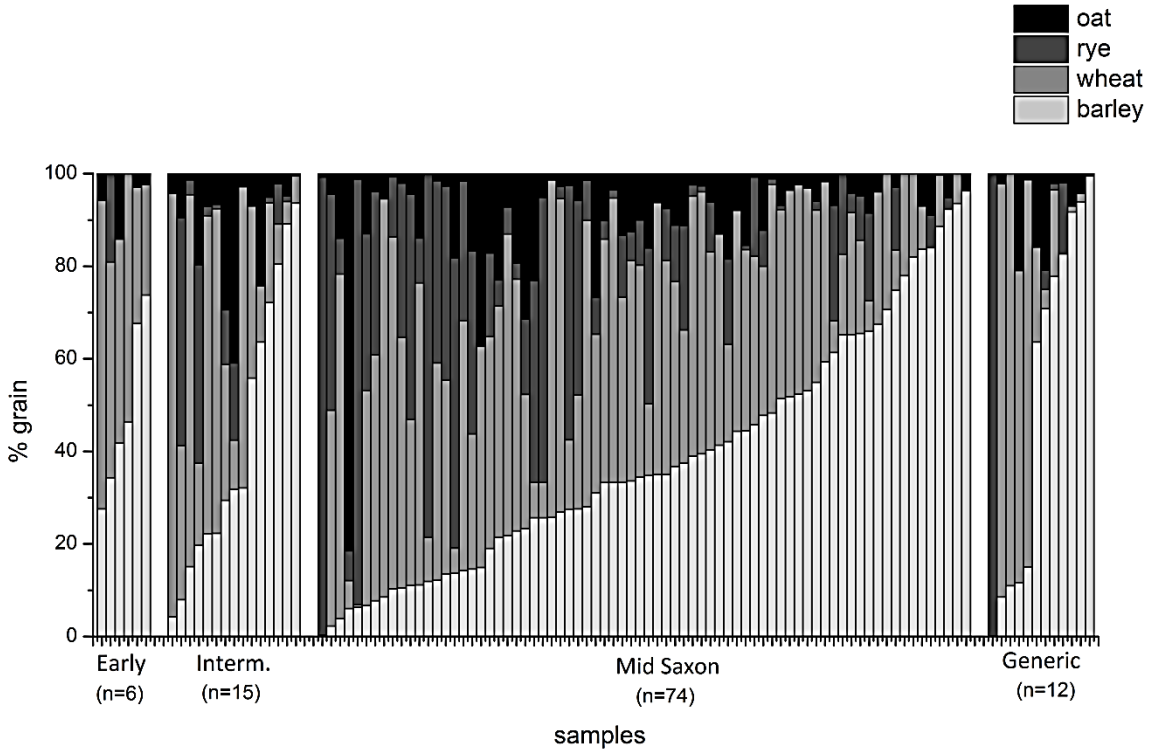


Figure 6.37 – Relative proportions of grain in free-threshing cereal samples (inclusive version).

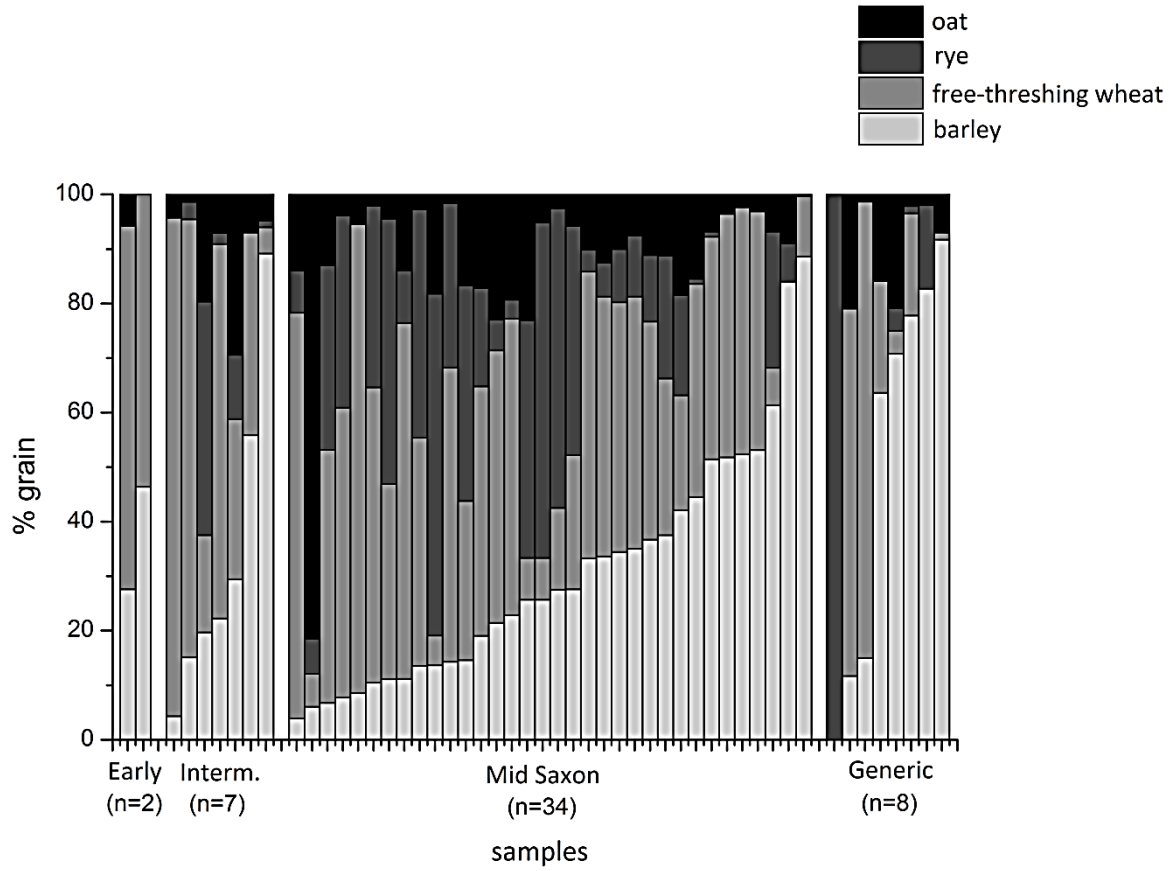


Figure 6.38 – Relative proportions of grain in free-threshing cereal samples (products only version).

It appears that there is also a geographical dimension to these patterns. In Figures 6.39-6.40, the samples are grouped according to extrinsic geographical and geological variables (for distribution of parent sites, see Figure 6.41). These loose environmental groupings seem to bear some relation to crop content, even in the more rigorous (products only) version of the analysis. Samples from the sandy Breckland are almost entirely dominated by rye and/or barley, both of which crops are generally more tolerant than free-threshing wheat of drier, poorer soils.[386] There is also a contrast between the chalklands and claylands of East Anglia: samples from the chalklands show much higher proportions of barley, while samples from the claylands are markedly richer in free-threshing wheat grains. This pattern perhaps accords with the common perception that wheat is better-suited to richer, clayey soils.[387]

The fenland samples are notable for their heterogeneity: those in the saline silt fens are dominated by salt-tolerant barley,[388] while those from Ely in the peat fens tend to contain higher proportions of free-threshing wheat and, in one case, rye.

The Ipswich samples show the greatest equality between the four cereals, with no single crop predominating across the whole assemblage. The representation of rye and oat is strong in Ipswich, compared to the other geographical groupings. Uniquely, sample <IPS19> is dominated by *Avena* grains: evidence in favour of the interpretation of oat as a crop rather than a weed, at least in this sample. Almost all of these Ipswich samples are Mid Saxon in date, thus accounting for much of the apparent increase in rye and oat among Mid Saxon samples.

Among the Thames valley samples, rye is a relatively minor occurrence, although oat constitutes a considerable proportion in many samples. The highest proportions of both rye and oat in this group are found in the sample from Chadwell St Mary near the Thames estuary, the

[386] Moffett 2006 p.48, Table 4.3.
[387] Maltby 1981 p.107.
[388] As observed by Murphy 2010 p.215.

easternmost site in this broad geographical grouping which could therefore be seen as a discrete phenomenon (*i.e.* representing the Thames estuary rather than the Upper/Middle Thames valley). Among the other samples in this group, free-threshing wheat is best represented in those from Walton Road Stores – a site which, like Chadwell St Mary, is marginal to the Thames valley proper; it is situated on an outcrop of clayey, sandy, Portland limestone, just to the west of the Bedfordshire and Cambridgeshire claylands, and could thus provide another illustration of a tendency towards wheat-richness in clayey areas. Elsewhere in the Thames valley, with both clay vales and gravel terraces available for cultivation, a greater balance between wheat, barley, and to a lesser extent oat and rye, is more typical.

It could therefore be suggested that, in terms of both presence and relative abundance, both barley and free-threshing wheat were common cereal crops throughout the Early and Mid Saxon periods, with the former perhaps favoured in lighter chalky or sandy areas, the latter in heavier clayey areas, but neither exclusively so. Oat and especially rye became increasingly widespread from the 7th and especially 8th century onwards, with rye being particularly common in East Anglia, and especially in the Breckland region, to whose sandy soils it was well-suited.

The notably heterogeneous cereal content of the Ipswich samples, with unusually high proportions of rye and oat, could reflect a very mixed local cropping regime, perhaps taking advantage of the clays, river gravels, and sandy heaths in the vicinity of the *emporium*. A similar heterogeneity emerges in the Mid Saxon sub-assemblage from Lyminge. The three 'product' samples identified in this sub-assemblage show striking differences in crop-dominance, with wheat dominating in <LYM05>, barley dominating in <LYM53>, and rye and oat unusually well represented in <LYM30> (Table 6.8).

Table 6.8 – Relative proportions of free-threshing cereal grains in 'product' samples from Lyminge.

sample	% free-threshing cereal grain				total grain
	barley	wheat	rye	oat	
<LYM05>	18.7	71.6	0.3	9.5	729
<LYM30>	17.7	21.2	34.4	26.7	1331
<LYM53>	80.5	13.6	0.3	5.6	734

This is not to say, however, that the four crops were necessarily grown together as a quadripartite maslin in such samples of mixed composition as <LYM30>. They could alternatively have been combined after processing, for storage and/or consumption. The same caveat applies to all of the samples discussed above in which different cereal crops co-occur. Mixed cropping – variously known as maslin, mixtil, dredge or other terms depending upon the crops involved – cannot be conclusively demonstrated in archaeobotanical samples, but neither can the possibility be entirely excluded, especially when the majority of samples here show a mixed cereal composition.[389] Since one of the purposes of maslin cultivation is risk-buffering, through the juxtaposition of crops with different tolerances/preferences, one could conjecture that the perceived rise in the cultivation of oat and rye, both of which are tolerant of relatively poor growing conditions, [390] may have served this purpose in Mid Saxon crop husbandry.

[389] Jones & Halstead 1995 p.104; Slicher van Bath 1963 pp.263–264.
[390] Moffett 2006 p.48, Table 4.3.

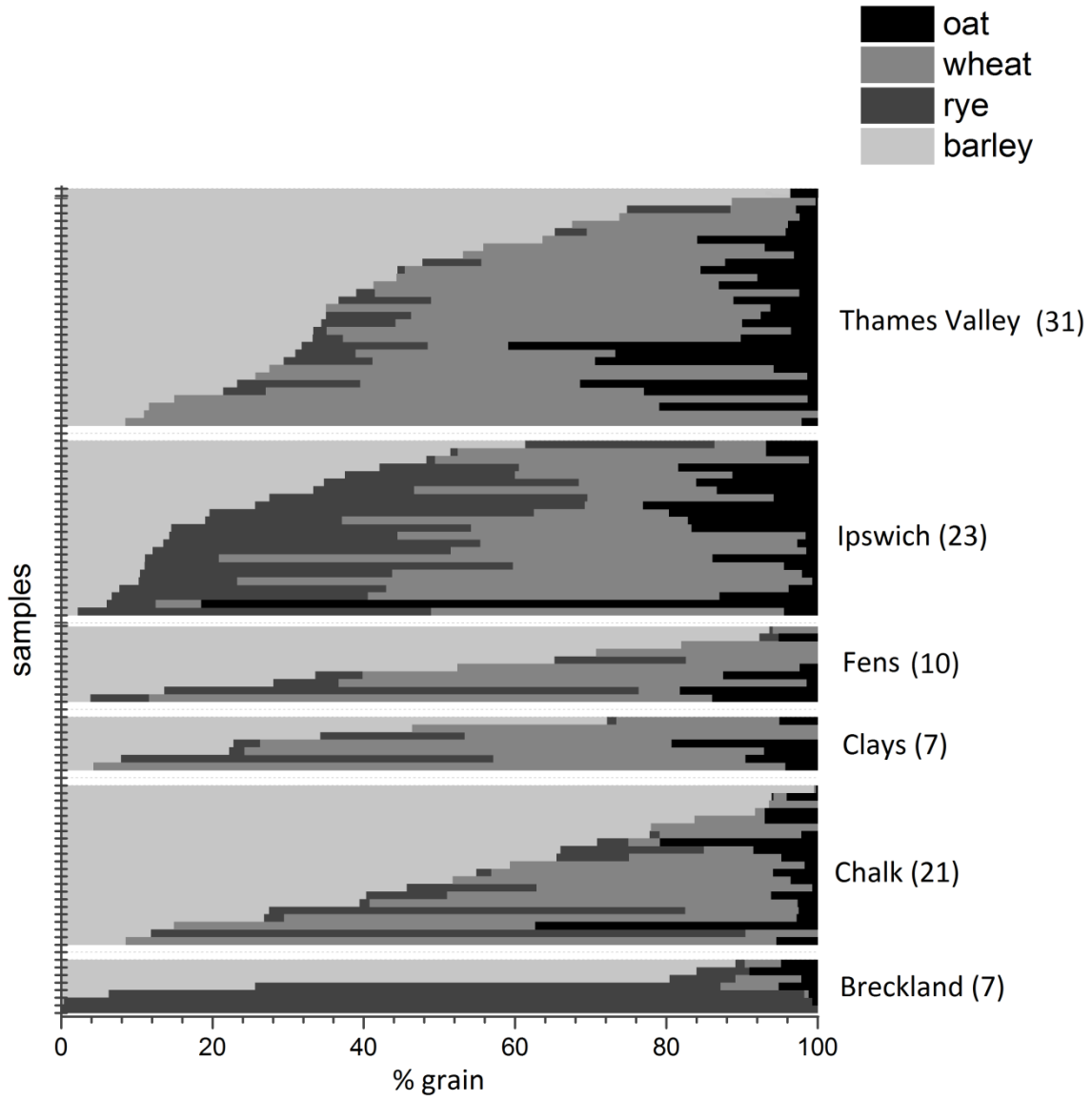


Figure 6.39 – Relative proportions of cereal grain in free-threshing cereal samples, grouped by geographical/geological region (inclusive version).

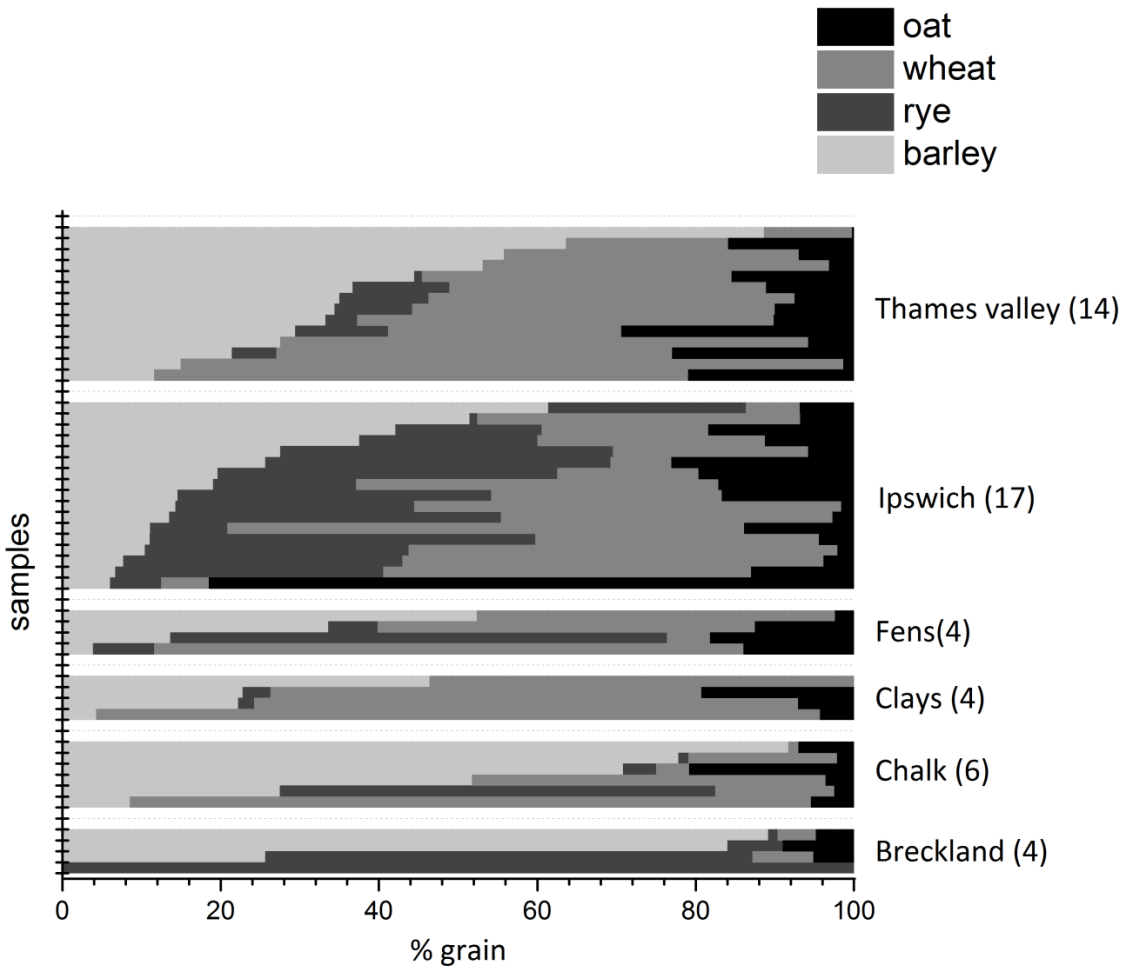


Figure 6.40 – Relative proportions of cereal grain in free-threshing cereal samples, grouped by geographical/geological region (products only version).



Figure 6.41 – Geographical/geological groupings employed in Figures 6.39–6.40 (Digital Mapping Data © Collins Bartholomew 1995).

6.6.3 Discussion

To summarize the arguments made thus far: (i) the cultivation of spelt declined gradually over the course of the 5th and perhaps 6th centuries, in a poorly understood 'Very Late Roman' phase of British agriculture; (ii) emmer and spelt may have persisted, or been reintroduced, on Mid Saxon sites with high-status associations; (iii) free-threshing wheat and barley were both important crops throughout the 5th-9th centuries, with little discernible change in their relative importance over time; and (iv) oat and rye *do* appear to have increased in importance from the 7th century onwards, especially in East Anglia, perhaps as part of a risk-buffering strategy involving maslin cultivation (although it cannot be proven that oat is always present as a crop rather than an arable weed). Besides these chronological patterns, there are some nascent geographical correlations, with emmer being particularly associated with the Upper/Middle Thames valley, free-threshing wheats with clayey areas, barley with silt fens and chalklands and – with rye – the Breckland.

Hence, Mid Saxon innovations in cereal cropping appear to have varied with region, geology, and perhaps status. The premises of the 'bread wheat thesis' are not, however, borne out by the results of this study: barley does not appear to have predominated in Early Saxon crop husbandry, nor does free-threshing wheat seem to have risen to dominance over barley in the Mid Saxon period. Both crops appear to have retained high importance throughout the 5th-9th centuries in the study regions. There is perhaps a small rise in the constancy of wheat, especially positively identified free-threshing wheat, from around the 7th century (Figures 6.30–6.31), but not to the extent of utter predominance.

These results are not necessarily incompatible with the documentary evidence adduced by Banham and Hagen in support of the 'bread wheat thesis'. For example, food-rents attest directly to the desirability of wheaten bread among landowners from around the 9th century onwards, whereas barley bread, according to Felix's *Life of St Guthlac* (8th century), appears to have been

appropriate sustenance for an ascetic anchorite, second only to starvation.[391] The former evidence falls at, or beyond, the end of the Mid Saxon period; but even if an élite preference for wheaten bread, and a very low cultural value for barley bread, were current prior to the 9th century, these cultural values would not necessarily be manifested economically in wheat-dominated cropping regimes, let alone wheat-dominated charred crop deposits. The presumed low status of barley bread would not be inconsistent with its widespread consumption by lower-status consumers. Alternatively or additionally, barley may have been – as Banham indeed suggests – the favoured crop for the brewing of beer, and therefore necessarily ubiquitous, regardless of the cultural status of barley bread.[392]

Evidence for brewing in the charred dataset is limited. Germinated grains can be indicative of malting, but this interpretation is not incontrovertible; sprouted grains might alternatively, for example, represent spoiled grain that had unintentionally sprouted whilst in storage. Nonetheless, the limited evidence would appear to be consistent with barley having had a key role in the production of Early/Mid Saxon beer. Germinated grains of oat occur at Ipswich and Lyminge; germinated glume wheats (mostly spelt, where identifiable) at Alchester, Bloodmoor Hill, and Harston Mill; but most common of all is germinated barley, found at Bishop's Cleeve, Bloodmoor Hill, Collingbourne Ducis, Harston Mill, Ipswich and Redcastle Furze (Thetford). Barley is also the prevailing grain – much of it having sprouted – in the charred samples from the Mid Saxon 'malting oven' at Higham Ferrers (Northants); Moffett suggests that barley may have been the favoured cereal for brewing, partly because of its low nitrogen content, producing beer that kept better.[393] It is thus possible, at least provisionally, to reconcile the culinary/cultural aspects of the 'bread wheat thesis' with the revised agricultural models arising from the results of this thesis.

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[391] Banham 2010 pp.176–177.
[392] Banham 2004 pp.25–26.
[393] Moffett in Hardy *et al.* 2007, p.163.

6.7 Weed ecology and crop husbandry practices

Arable weed species whose seeds have been preserved among charred crop remains have the potential to shed light upon growing conditions – and, by extension, crop husbandry strategies – in antiquity.[394] After applying the amalgamation criteria set out above,[395] 212 taxa in the charred dataset were classified as possible arable weeds, constituting the second most ubiquitous class of botanical remains in the charred dataset after cereals. It should be noted that, in several instances, these taxonomic categories overlap, *e.g. Poa annua* L., *Poa* L., and *Poaceae*. There is also a considerable degree of ambiguity in the distinctions between arable weeds and deliberately gathered 'useful' wild taxa, as already discussed.[396] Besides these ambiguities of classification, the sheer number of potential weed taxa renders it impractical to analyse each of these in individual detail. This section will therefore employ two different approaches, one selective and one more generalized and exploratory. Firstly, presence analysis is used to identify those wild/weedy species which display the greatest change in constancy between the Early and Mid Saxon periods, and so to consider possible changes in arable environments over this period. Secondly, the more exploratory technique of correspondence analysis is used to consider the presence and relative abundance of a wider range of taxa.

6.7.1 Changes in presence

In terms of both assemblages and samples, the presence values of most taxa increase somewhat between the Early and Mid Saxon periods. To some extent, this pattern may simply reflect the generally greater abundance of charred plant remains that survive from the latter period: the Mid Saxon dataset is larger, and therefore the probability of any taxon's occurrence is, in theory, correspondingly greater. The principal interest here is in those species whose presence

[394] See above, §§2.5–2.6.
[395] See above, §3.9.2.
[396] See above, §6.3.4.

values change to an unusual extent over time. Only species-level identifications (including those embracing two or three closely-related species) are considered, to circumvent the problematizing effects of overlapping categories at genus- and family-level. After examining the range of values for increases in presence between the Early and Mid Saxon periods, it was judged that a change of >15% in terms of assemblages, or >10% in terms of samples, should be deemed significant.

The species thus selected are listed in Table 6.9. For most of these species, presence values increase progressively through Early, Intermediate and Mid Saxon assemblages and samples, although a few (*e.g. Agrostemma githago*) undergo a fall in presence in the Intermediate phase before a steep Mid Saxon rise. While the listed species do not seem to constitute a single, coherent group in ecological terms, certain trends are apparent. Several species are relatively nitrophilous (Ellenberg N7-9): *Atriplex patula/prostrata*, *Malva sylvestris*, *Chenopodium album*, *Polygonum aviculare*, and especially *Urtica dioica* and *Hyoscyamus niger.* Spike-rush (*Eleocharis palustris/uniglumis*) indicates wet soils, and stinking chamomile (*Anthemis cotula*), whose increase in presence is among the highest of any species, is characteristic of heavy clay soils, which may in turn imply the practice of heavy ploughing.[397]

Overall, therefore, these results indicate that from the 7th and especially 8th centuries onwards, heavy clay soils, wet soils, and nitrogen-enriched soils become better represented in the ecological profiles of charred plant remains. While not directly indicative of any specific innovations, these patterns would be consistent with the extension of arable land onto previously uncultivated clays, perhaps with the associated (re)introduction of heavy ploughing; and an intensification of soil-enrichment strategies, such as manuring, middening, or folding, to keep arable land 'in good heart'.[398]

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[397] Kay 1971 p.625; Williamson 2003, p.121; Stevens in Hey 2004, p.362.
[398] Williamson 2003, pp.79-81.

Table 6.9 - Presence analysis of selected potential arable weed species in the charred dataset.

species	Early–Mid Saxon % increase	% presence in assemblages			
		Early Saxon (n=34)	Intermediate (n=20)	Mid Saxon (n=36)	Generic (n=13)
Atriplex patula L./*prostrata* (Boucher ex. DC.)	29.2	23.5	40.0	52.8	23.1
Agrostemma githago L.	24.3	11.8	5.0	36.1	23.1
Anthemis cotula L.	23.5	26.5	55.0	50.0	15.4
Malva sylvestris L.	21.4	14.7	30.0	36.1	7.7
Eleocharis palustris (L.) Roem. & Schult./*uniglumis* (Link) Schult.	20.6	29.4	50.0	50.0	7.7
Chenopodium album L.	20.4	32.4	40.0	52.8	38.5
Polygonum aviculare L.	20.4	32.4	25.0	52.8	7.7
Raphanus raphanistrum L.	19.1	5.9	15.0	25.0	
Urtica dioica L.	16.7		10.0	16.7	
Hyoscyamus niger L.	16.3	5.9		22.2	
Medicago lupulina L.	16.3	5.9	5.0	22.2	15.4
		% presence in samples			
		Early Saxon (n=115)	Intermediate (n=101)	Mid Saxon (n=240)	Generic (n=43)
Anthemis cotula L.	18.4	9.6	21.8	27.9	9.3
Atriplex patula L./*prostrata* (Boucher ex. DC.)	16.3	8.7	11.9	25.0	7.0
Eleocharis palustris (L.) Roem. & Schult./*uniglumis* (Link) Schult.	14.3	15.7	16.8	30.0	2.3
Chenopodium album L.	13.1	16.5	18.8	29.6	20.9
Agrostemma githago L.	11.9	3.5	1.0	15.4	9.3
Malva sylvestris L.	11.0	6.1	8.9	17.1	2.3

6.7.2 Correspondence analysis

Following the amalgamation and exclusion of certain taxonomic groups in accordance with the principles outlined above,[399] correspondence analysis could utilize 154 taxonomic categories (each present in at least ten samples) and 242 samples (each containing at least 30 standard items), including the ten samples from Lyminge. Four samples were then removed as outliers of unusual botanical composition (graphs not shown). These samples have already been identified above as atypical: <SH2> and <SH4> with high proportions of *Juncus*; <HUT5> with 700 tentative black mustard seeds; and <SMB16> which is dominated by flax remains.

[399] See above, §3.9.2.

Among the remaining samples, there is a prevailing tendency for those rich in cereal grain to lie towards the negative end of the x-axis, while those richer in weed seeds tend to fall further towards the positive end (Figure 6.42). On the y-axis, there is some separation between those rich in grain at the negative end, and those richer in chaff (rachis nodes, glume bases, culm nodes) towards the positive end. Hence, the main compositional variation among the charred samples is most likely to be due to crop processing, separating products from by-products. This interpretation is very broadly confirmed if samples are coded by their discriminant analysis crop processing classifications, and again by their 'matching' crop processing classifications, with 'clean' FSP samples tending to lie towards the bottom left of the graph in both cases (Figures 6.43–6.44).[400] In order to exclude the potentially biasing effects of crop processing upon the representation of arable weed seeds, the product samples (FSP/USG) can be isolated as a discrete group of comparable origin, and used exclusively in the subsequent weed ecological analyses. All of these samples are dominated by free-threshing cereals.

In summary, the following analysis of weed ecology is restricted to those samples dominated by free-threshing cereals thought to represent fine sieved or un-sieved grain products (FSP/USG), and to those taxonomic groupings which represent (i) possible arable weeds, and (ii) a single species, or two alternative species with closely comparable ecological profiles. The selected samples each contain at least ten standard items assigned to these species, while the species each occur in at least three samples.

[400] See above, §6.4.4.

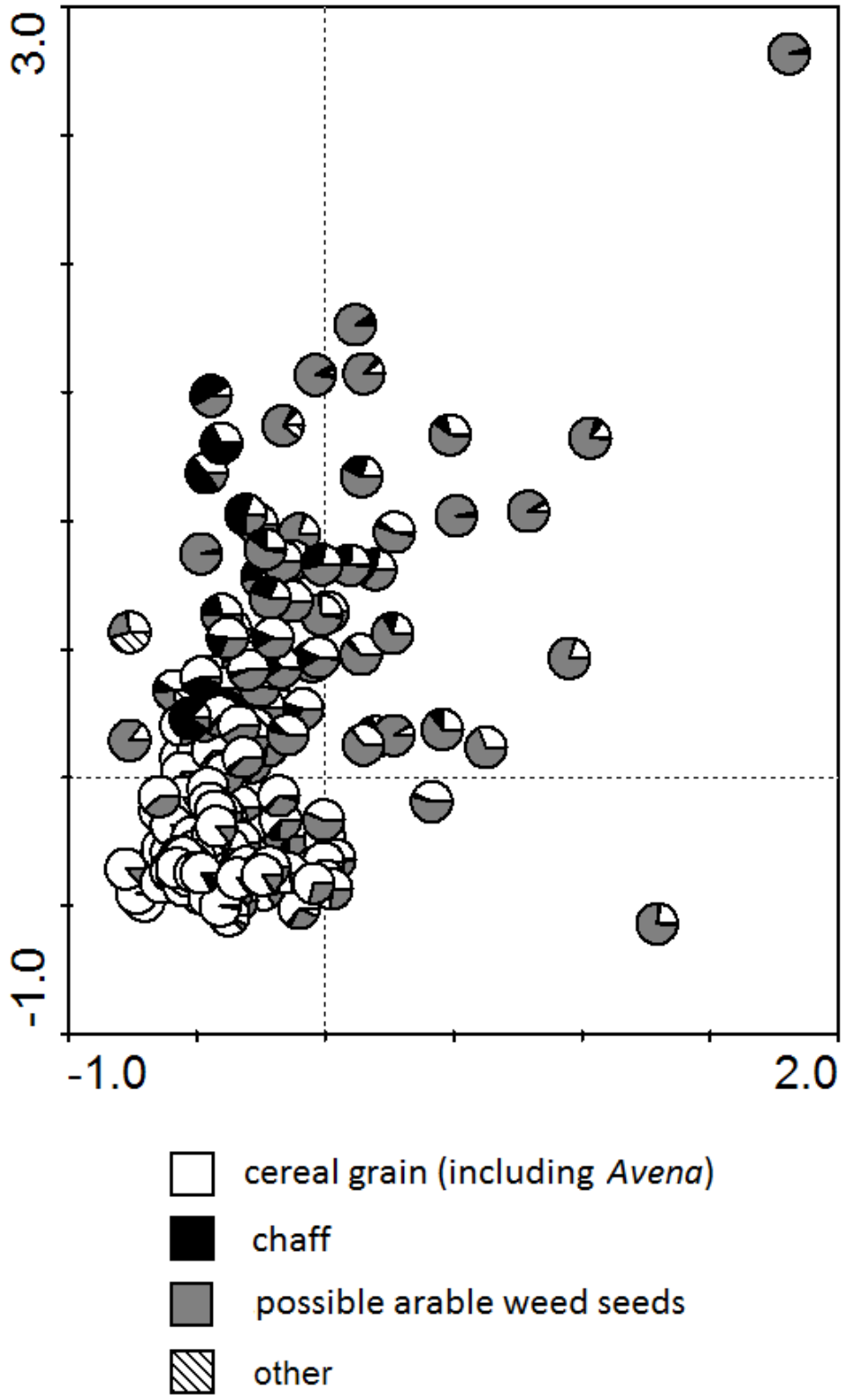


Figure 6.42 – Correspondence analysis plot of charred samples, displaying basic taxonomic composition.

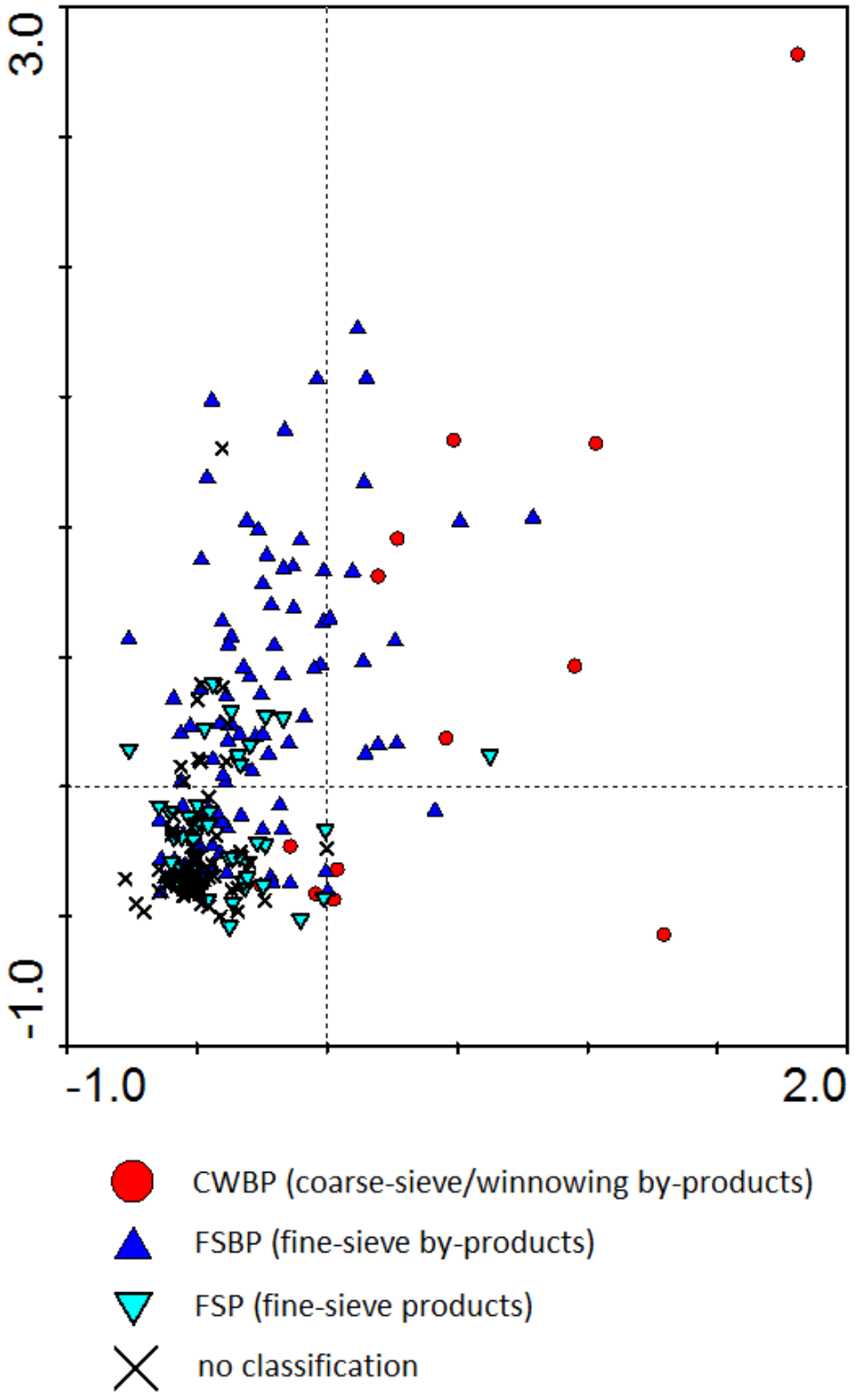


Figure 6.43 – Correspondence analysis plot of charred samples, coded by classifications from discriminant analysis of weed seed types.

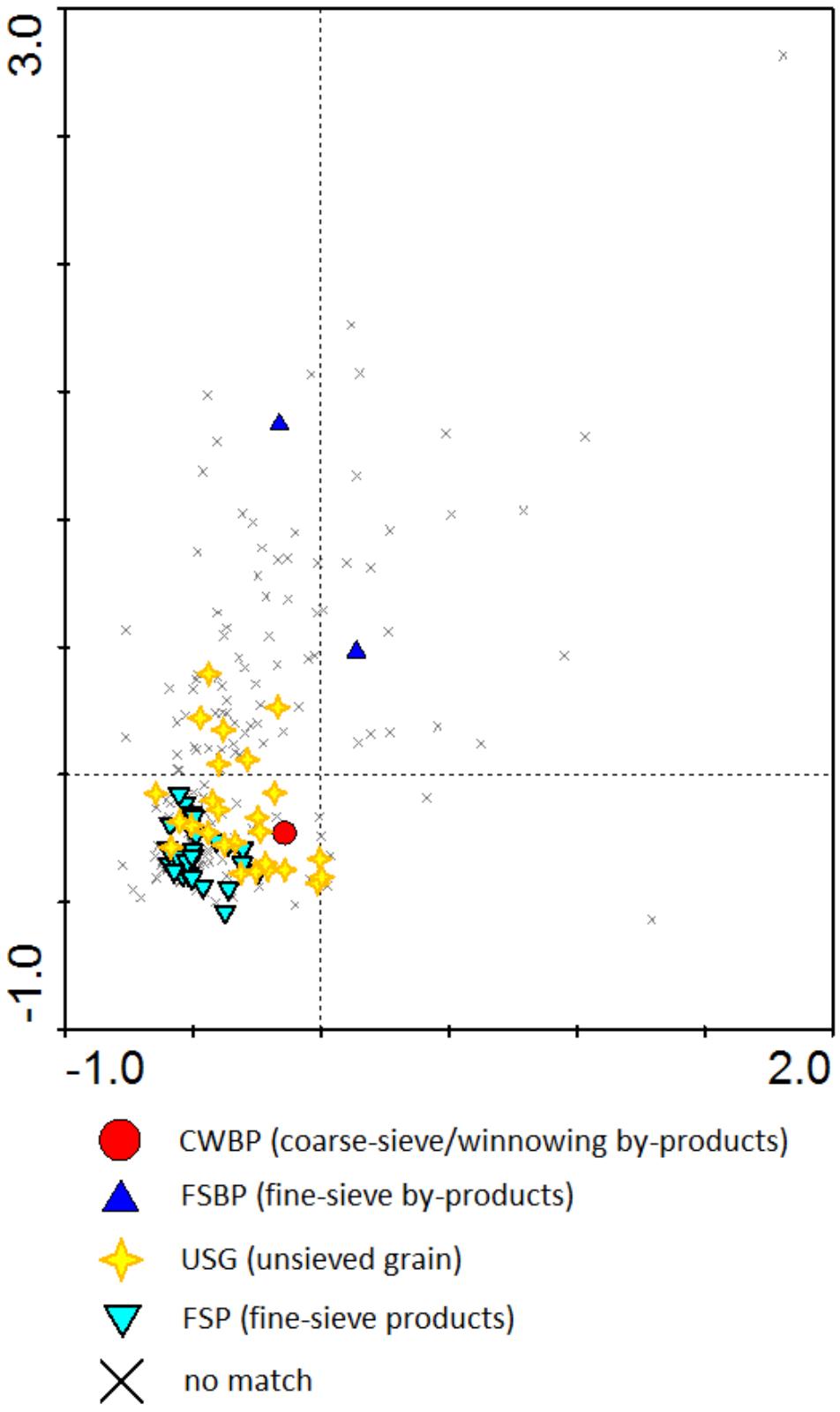


Figure 6.44 – Correspondence analysis of plot of charred samples, coded by 'matching' crop processing analysis classifications.

The reduced quorum for sample abundance (ten items, rather than the 30 required elsewhere in this thesis) is intended to maximise usable data, since 'product' samples will by definition be relatively poor in weed seeds. These criteria result in 31 samples and 23 species being available for analysis. Of these samples, <WST2> appears as an outlier because of its relatively high proportion of corncockle seeds (*Agrostemma githago* L.), and it has therefore been omitted so that underlying patterns among the remaining samples may be explored. The species are listed in Table 6.10, the samples in Table 6.11. The samples in question are largely of Mid Saxon date (25 of 31 samples), with only four Intermediate and one Early Saxon sample included. This bias can be explained by the generally greater abundance of charred material in the Mid Saxon period.[401] Hence, there is practically no opportunity in this analysis to explore diachronic trends in weed ecology.

The basic results of the weed-based correspondence analysis are displayed in Figures 6.45–6.46. There is only a weak separation between FSP and USG samples along the x-axis (Figure 6.47). Hence, the variations in botanical composition are unlikely to be an artefact of fine sieving in the crop processing sequence. A stronger pattern is seen if samples are coded by their sites of origin (Figure 6.48). Specifically, among the major sites featured in this analysis, there is some separation along the x-axis, between Ipswich and Lyminge towards the negative end and Yarnton and Ely (Ashwell Site) towards the positive end. Since this apparent clustering does not correspond directly with geographical proximity or geological similarity, it raises the possibility that different crop husbandry regimes may be responsible for the differences in weed seed content.

[401] See above, §6.5.

Table 6.10 – Selected species and ecological variables used in correspondence analysis of products and weeds (* denotes perennials which could regenerate from vegetative fragments).

code	botanical name	common name	life history	flowering onset/duration	Ellenberg numbers[402]				flowering height (cm)
					F	R	N	S	
aetcyn	*Aethusa cynapium* L.	Fool's Parsley	annual	late	4	7	6	0	100
agrgit	*Agrostemma githago* L.	Corncockle	annual	early/short	5	6	5	0	100
antcot	*Anthemis cotula* L.	Stinking Chamomile	annual	late	5	6	6	0	60
atpapr	*Atriplex patula* L./*prostrata* (Boucher ex. DC.)	Common /Spear-leaved Orache	annual	intermediate	6	7	7	2	94
branig	*Brassica nigra* (L.) W.D.J. Koch	Black Mustard	annual	early/short	5	7	6	0	150
brhose	*Bromus hordeaceus* L./*secalinus* L.	Soft /Rye Brome	annual	early/short	4	6	4	0	90
chealb	*Chenopodium album* L.	Fat hen	annual	late	5	7	7	1	100
clamar	*Cladium mariscus* (L.) Pohl	Great Fen-sedge	perennial	late	10	8	4	0	200
elpaun	*Eleocharis palustris* (L.) Roem. & Schult./*uniglumis* (Link) Schult.	Common/Slender Spike-rush	perennial*	early/short	9	7	4	3	60
falcon	*Fallopia convolvulus* (L.) Á. Löve	Black bindweed	annual	late	4	7	5	0	100
galapa	*Galium aparine* L.	Cleavers	annual	intermediate	6	7	8	0	150
lapcom	*Lapsana communis* L.	Nipplewort	annual	intermediate	4	7	7	0	95
loltem	*Lolium temulentum* L.	Darnel	annual	early/short	4	8	7	0	90
malva	*Malva sylvestris* L.	Common Mallow	perennial	intermediate	4	8	7	0	150
medicg	*Medicago lupulina* L.	Black Medick	either	intermediate	4	8	4	0	50
plalan	*Plantago lanceolata* L.	Ribwort Plantain	perennial	intermediate	5	6	4	0	15
polavi	*Polygonum aviculare* L.	Knotgrass	annual	late	5	6	7	0	30
ranrap	*Raphanus raphanistrum* L.	Radish	either	intermediate	5	6	6	0	70
rumact	*Rumex acetosella* L.	Sheep's Sorrel	perennial*	intermediate	5	4	3	0	30
rucrlo	*Rumex crispus* L./*longifolius* DC.	Curled/Northern Dock	perennial*	intermediate	6	7	7	1	110
spearv	*Spergula arvensis* L.	Corn Spurrey	annual	early/short	4	5	5	0	30
trmain	*Tripleurospermum maritimum* (L.) W.D.J. Koch/*inodorum* (L.) Sch. Bip.	Sea/Scentless Mayweed	either	late	5	6	6	1	60
urture	*Urtica urens* L.	Small Nettle	annual	intermediate	5	6	8	0	60

[402] F= *Feuchtigkeit* (moisture), R = Reaction (acidity), N = Nitrogen, S = Salinity. Note that higher moisture, nitrogen, and salt tolerances are indicated by higher values for F, N and S respectively; whereas *lower* values for R indicate higher acidity tolerance, and higher values for R denote greater alkaline tolerance.

Table 6.11 – Samples and attributes used in correspondence analysis of products and weeds.

code	site	period	USG/FSP	sowing time discriminant analysis classification	feature type
ENB3	Eynesbury	Early	USG	autumn	SFB
FOR1	Forbury House	Mid	USG	autumn	pit
GAM2	Gamlingay	Intermediate	USG	autumn	pit
IPS11	Ipswich	Mid	USG	autumn	pit
IPS19	Ipswich	Mid	FSP	autumn	pit
IPS2	Ipswich	Mid	FSP	autumn	pit
IPS21	Ipswich	Mid	FSP	n/a	pit
IPS26	Ipswich	Mid	FSP	n/a	other
IPS3	Ipswich	Mid	USG	autumn	other
IPS30	Ipswich	Intermediate	FSP	autumn	ditch
IPS30	Ipswich	Intermediate	FSP	autumn	ditch
IPS32	Ipswich	Mid	USG	autumn	other
IPS5	Ipswich	Mid	FSP	autumn	pit
IPS9	Ipswich	Mid	FSP	autumn	pit
LLC22	Cottenham	Mid	USG	spring	other
LYM05	Lyminge	Mid	FSP	autumn	pit
LYM30	Lyminge	Mid	FSP	autumn	pit
LYM53	Lyminge	Mid	USG	autumn	pit
RFT6-7	Redcastle Furze	Intermediate	FSP	n/a	SFB
ROS2	Rosemary Lane	Mid	FSP	spring	ditch
SMB3	Brandon	Mid	USG	autumn	other
WFR1	Ashwell Site	Mid	USG	autumn	pit
WFR4	Ashwell Site	Mid	USG	n/a	posthole
WFR5	Ashwell Site	Mid	USG	autumn	pit
WST2	West Stow	Generic	USG	autumn	pit
Y22	Yarnton	Intermediate	USG	spring	ditch
Y26	Yarnton	Mid	USG	autumn	ditch
Y30	Yarnton	Mid	USG	autumn	pit
Y34-5	Yarnton	Mid	USG	autumn	other
Y38	Yarnton	Mid	USG	n/a	ditch
Y39	Yarnton	Mid	USG	n/a	ditch
Y49	Yarnton	Mid	FSP	autumn	other

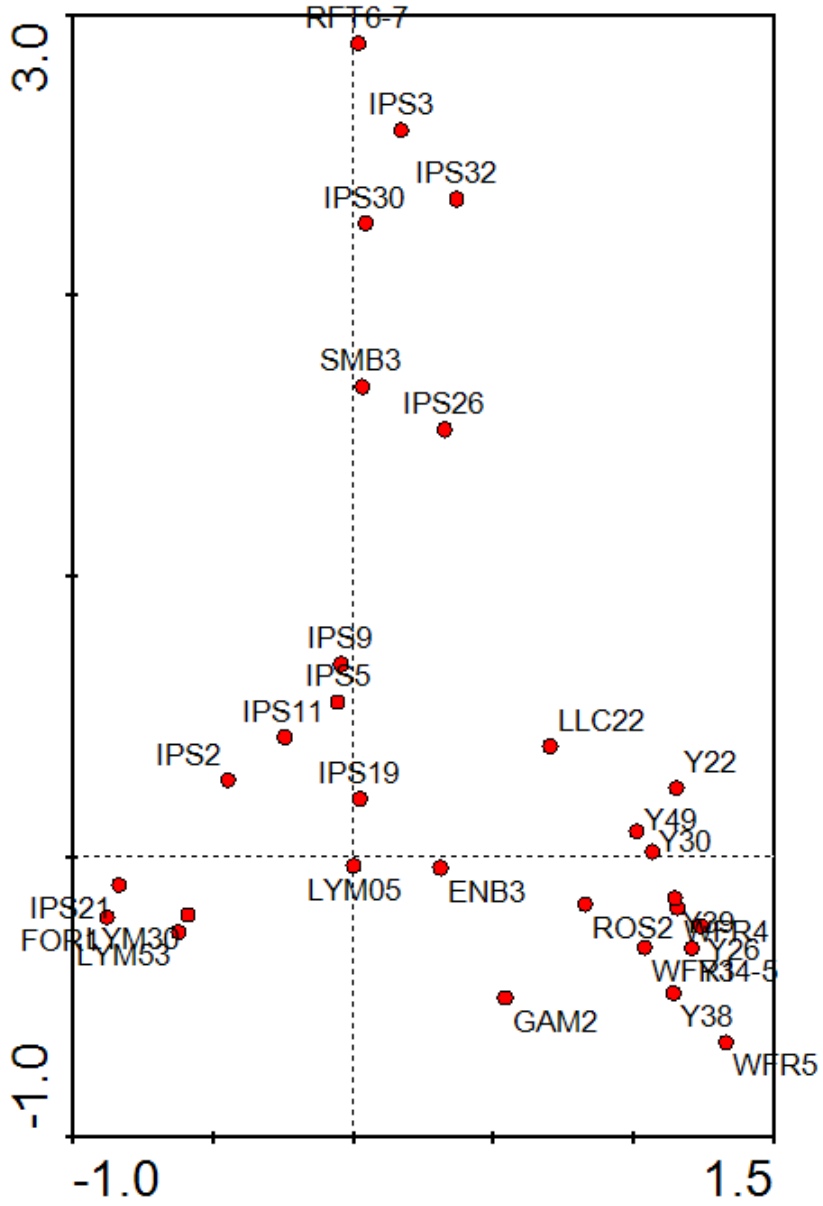


Figure 6.45 – Distribution of samples in correspondence analysis of products and weeds.

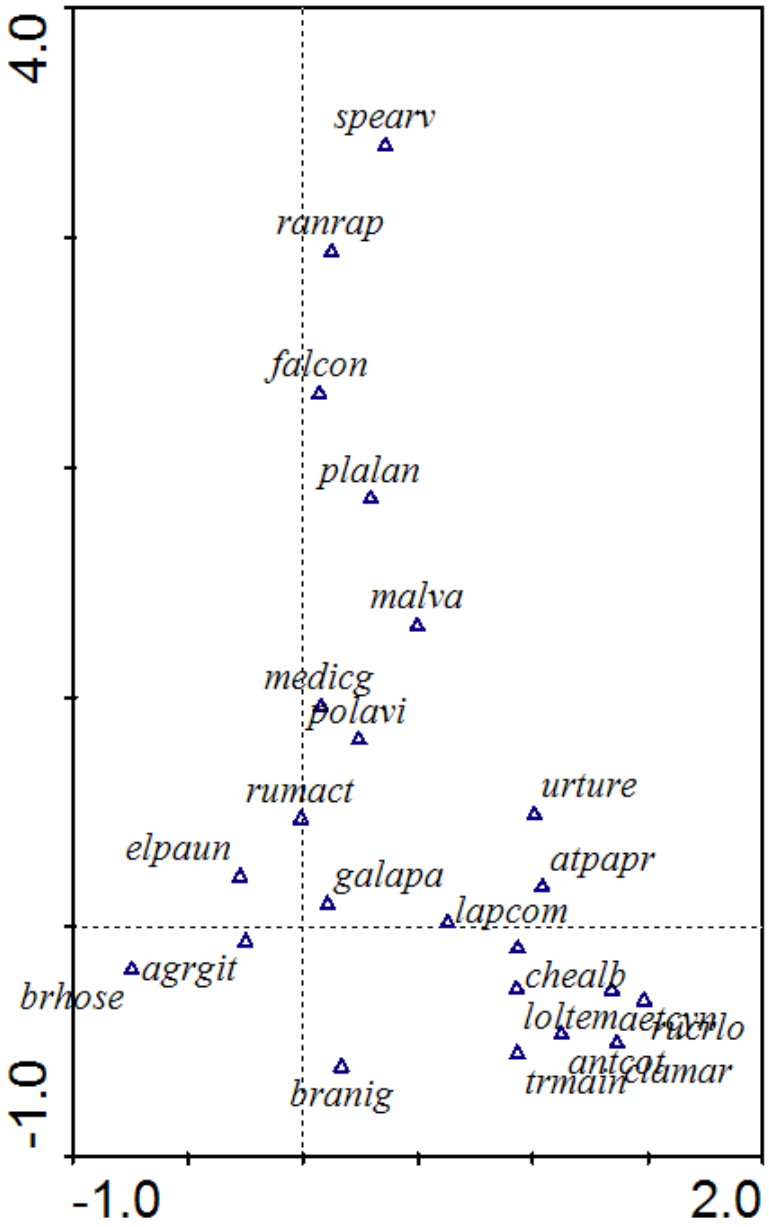


Figure 6.46 – Distribution of species in correspondence analysis of products and weeds.

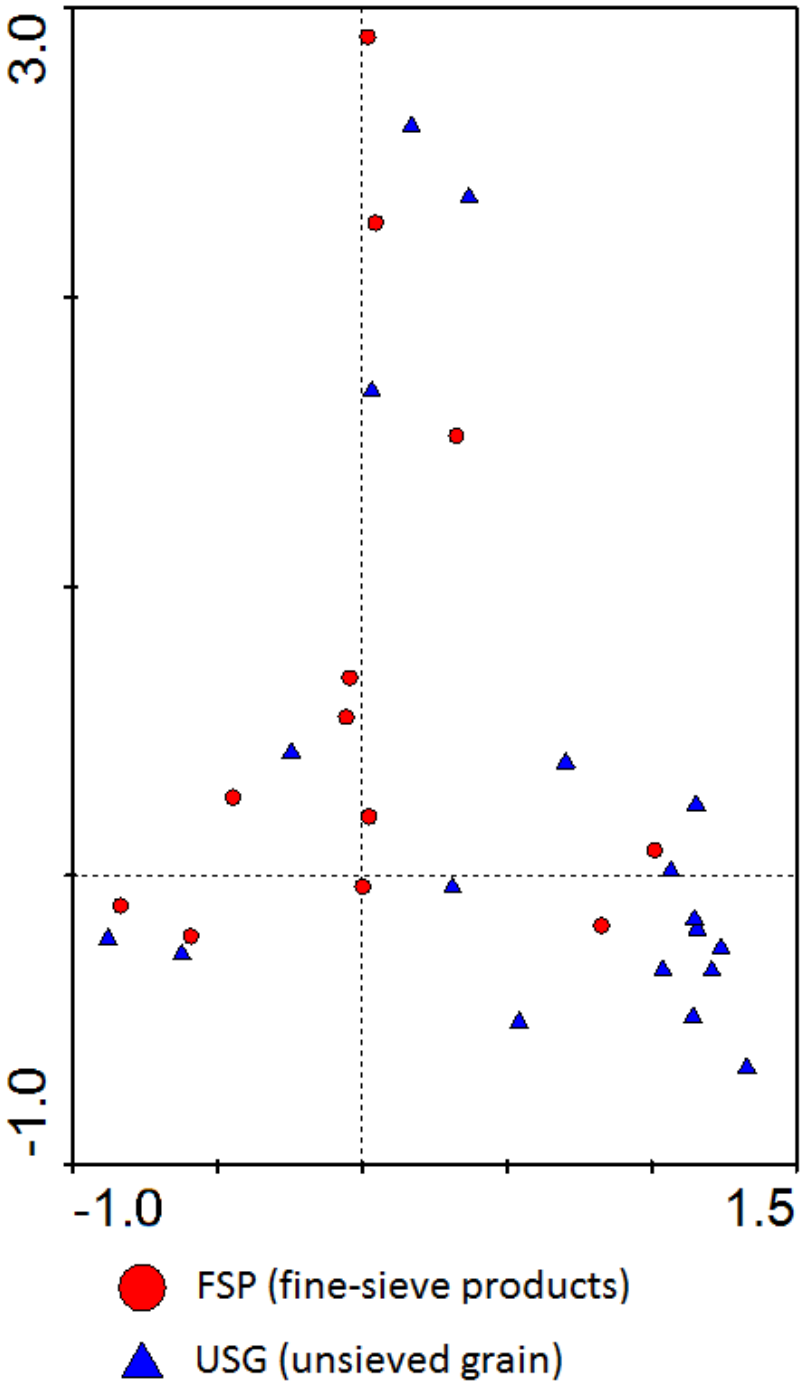


Figure 6.47 – Distribution of samples coded by crop processing classification.

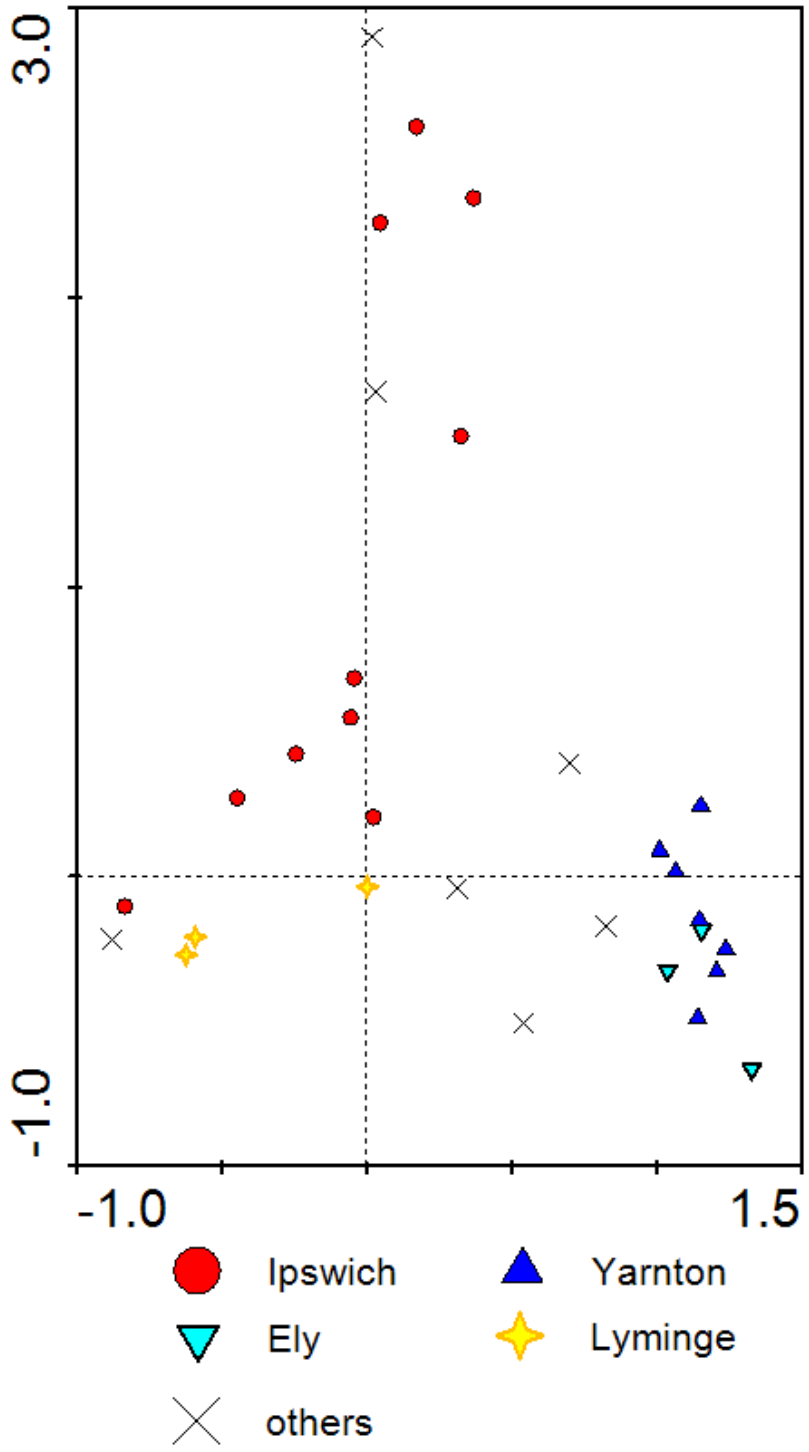


Figure 6.48 – Distribution of samples coded by major sites.

In order to explore this possibility further, species were coded by different ecological variables, as outlined in Chapter 3 and summarized in Table 6.10.[403] Some variables revealed few or no discernible patterns on the x-axis (salinity, acidity, flowering height, and life history; graphs not shown). Moisture preferences ('F') appear to account for some of the variation on the x-axis, although the strongest separation is between F4 and F5 taxa, and therefore any variability in moisture preferences can only be very slight (Figure 6.49). Nitrogen preferences ('N') seem to account for a greater degree of variation on the x-axis, with the less nitrophilous species better represented towards the negative end, and the more nitrophilous species better represented in the samples at the positive end (Figure 6.50). Arguably, however, the most striking gradient is that shown by flowering onset and duration, here used as a proxy for seasonality in cropping (Figure 6.51). Annual species with an early, short flowering period (at more of a competitive advantage among autumn-sown crops) are better represented at the negative end of the x-axis; whereas those with a late flowering period plus perennials which can regenerate from vegetative fragments (all at a theoretical advantage among spring-sown crops) are better represented at the positive end of the x-axis. The discriminant analysis of sowing seasonality, as described in Chapter 3, classified most samples as autumn-sown.[404] The few spring-sown classifications are each based upon fewer than five occurrences of the relevant species, and are therefore of dubious interpretative significance. Nonetheless, it is notable that they occur among the putative spring-sown samples characterised by late-flowering annuals at the positive end of the x-axis (Figure 6.52). Moreover, there is an expected bias towards autumn-sowing indicator species among crop processing products (as opposed to by-products); the product samples at the positive end of the x-axis which appear to be spring-sown thus contradict the predicted bias.[405] Hence, the seasonality gradient cannot be dismissed as an artefact of crop processing, and it remains

[403] See above, §3.9.5.
[404] See above, §§3.9.5–3.9.6.
[405] Bogaard *et al.* 2005 p.507.

possible that the apparent distinction between autumn- and spring-sown samples represents a genuine pattern.

It is harder to identify a compelling ecological gradient corresponding to the variation on the y-axis. There is perhaps a weak trend in acidity: 'R' values appear to be slightly higher among the samples towards the positive end of the y-axis (denoting greater tolerance of alkaline soils), and somewhat lower towards the negative end (denoting greater tolerance of acidic soils), but the pattern is not consistent (Figure 6.53). A more nuanced interpretation can be proposed for the six samples drawn out towards the positive end of the y-axis: <RFT6-7>, <IPS3>, <IPS26>, <IPS30>, <IPS32>, and <SMB3>. The weed species most strongly associated with the positive end of the y-axis are corn spurrey (*Spergula arvensis* L.) and wild radish (*Raphanus raphanistrum* L.), both of which are frequently associated with acidic sands and other non-calcareous soils (Figure 6.46).[406] Two of the six samples in this part of the graph represent Breckland sites (Brandon and Redcastle Furze) and the other four are from Ipswich, whose immediate hinterland includes the sandy coast of Suffolk. Thus, it is possible to argue, with due caution given the small size of the available dataset, that these six samples could represent sandier growing environments than those represented by samples closer to the origin and the negative end of the y-axis.

By extension, it could be possible to identify at least two distinct arable environments supplying cereals to Ipswich, exploiting the two different principal landscapes between which the site is situated: the sandy coastal hinterland to the east, and the East Anglian Plain with its slower-draining soils upon chalky boulder clay inland to the west. The presumed inland samples are those which, as argued above, appear to represent autumn-sown crops. The presumed 'sandy' coastal samples contain relatively high proportions of intermediate or perennial species and are therefore of uncertain seasonality, although <IPS3> appears autumn-sown.

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[406] Stace 2010 pp.418, 467; Clapham *et al.* 1962 pp.133–134; 257–258.

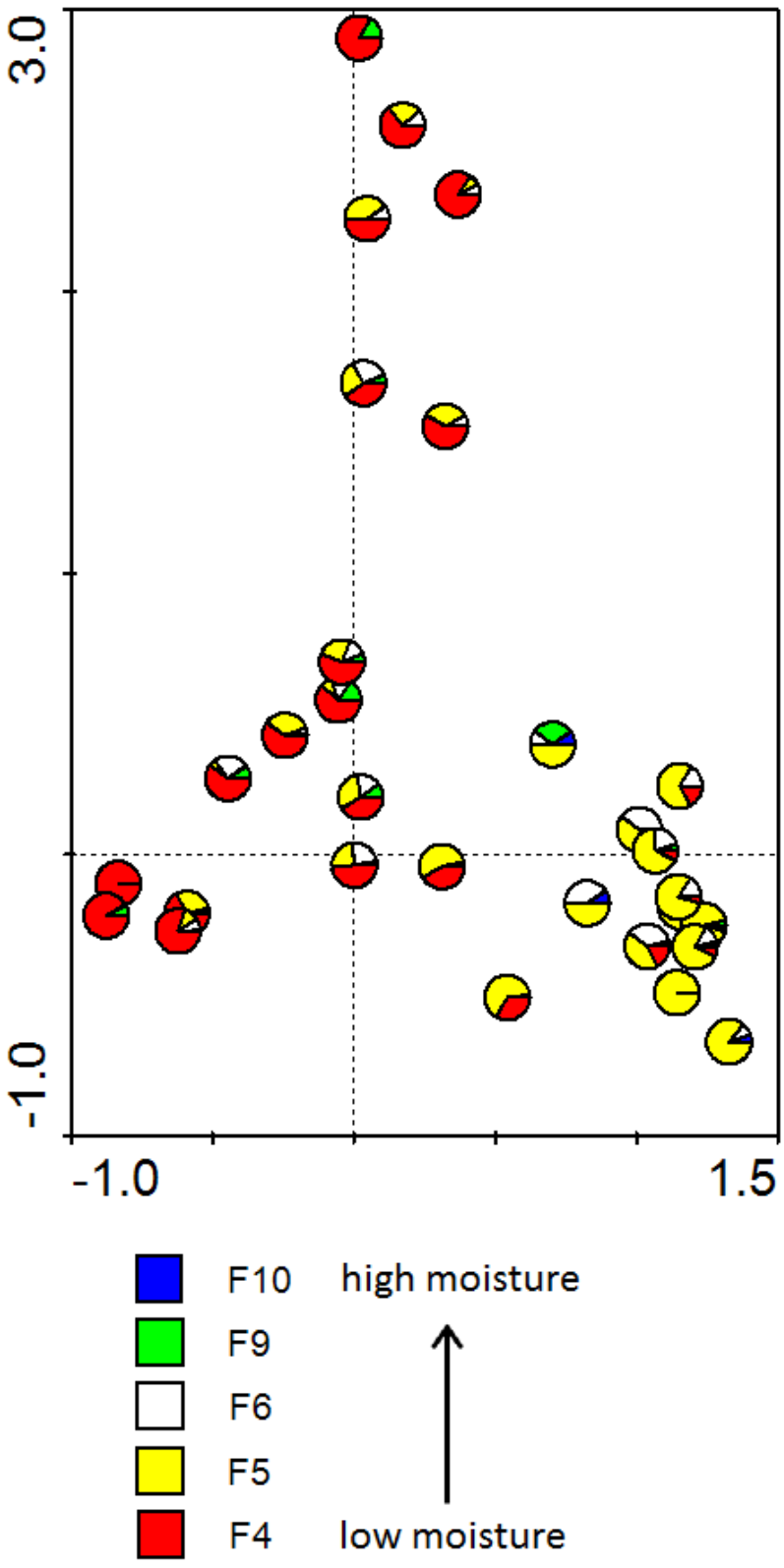


Figure 6.49 – Distribution of samples coded by moisture preferences (Ellenberg numbers for '*Feuchtigkeit*').

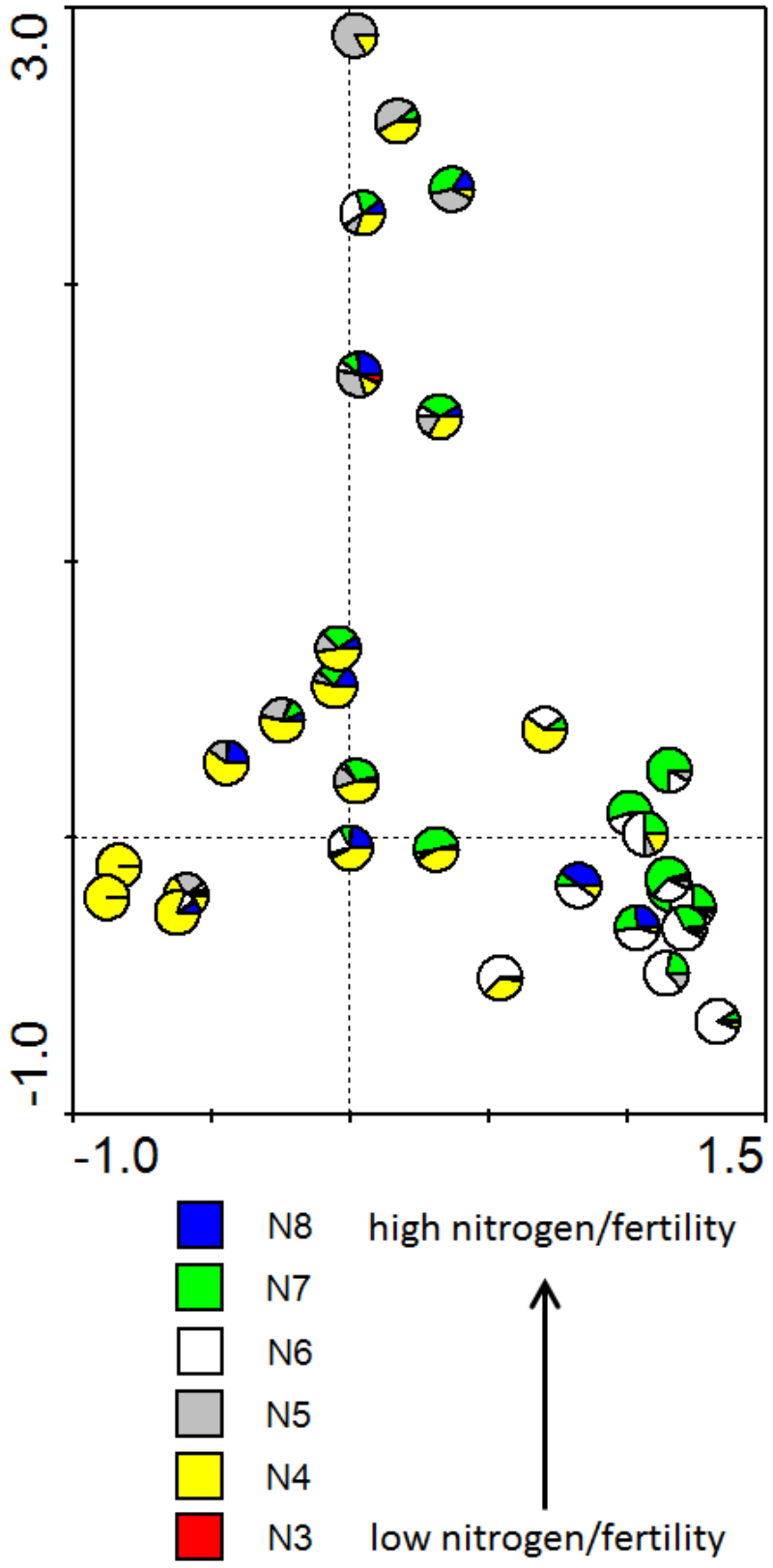


Figure 6.50 – Distribution of samples coded by nitrogen preferences (Ellenberg numbers).

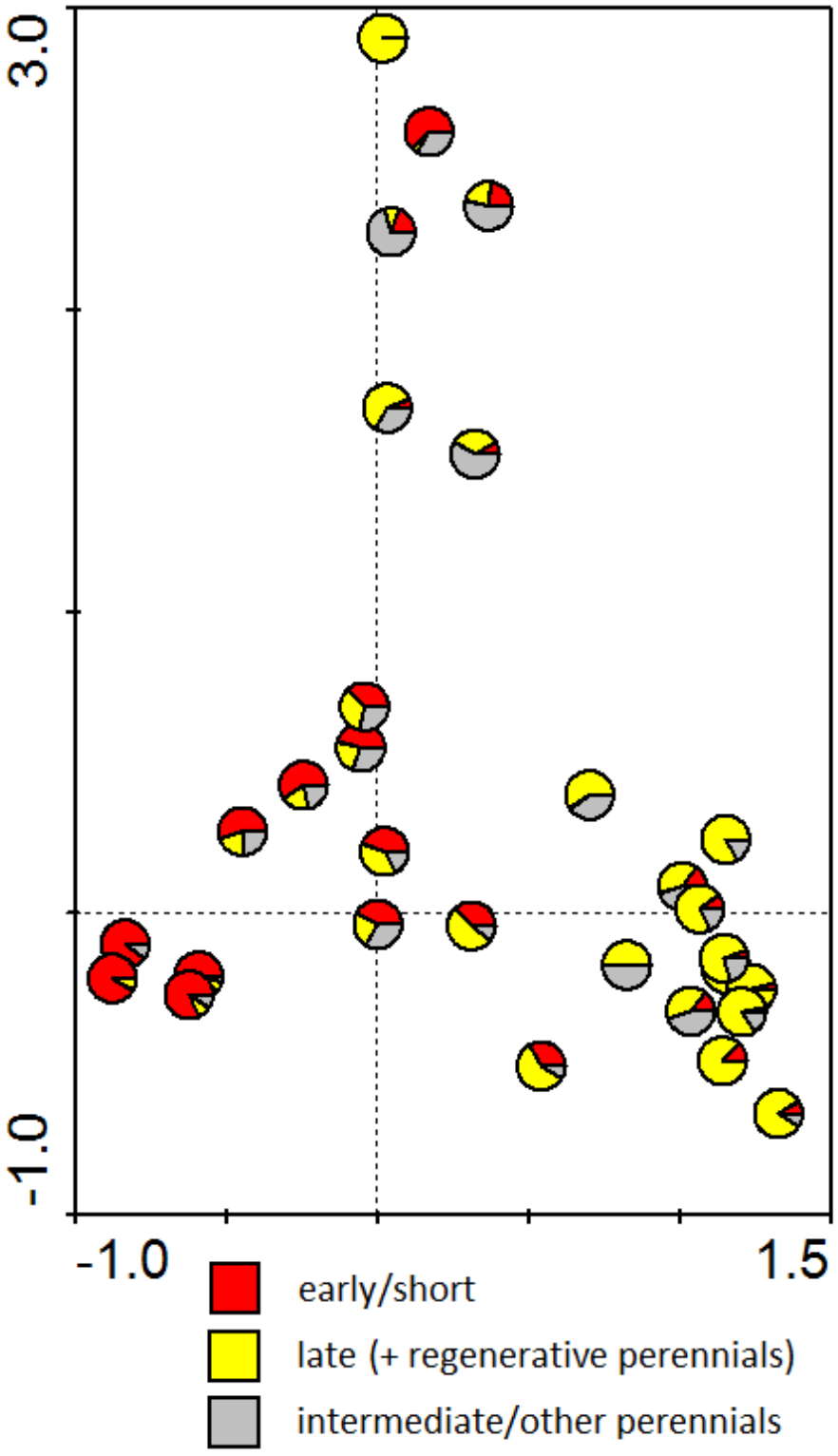


Figure 6.51 – Distribution of samples coded by flowering onset and duration.

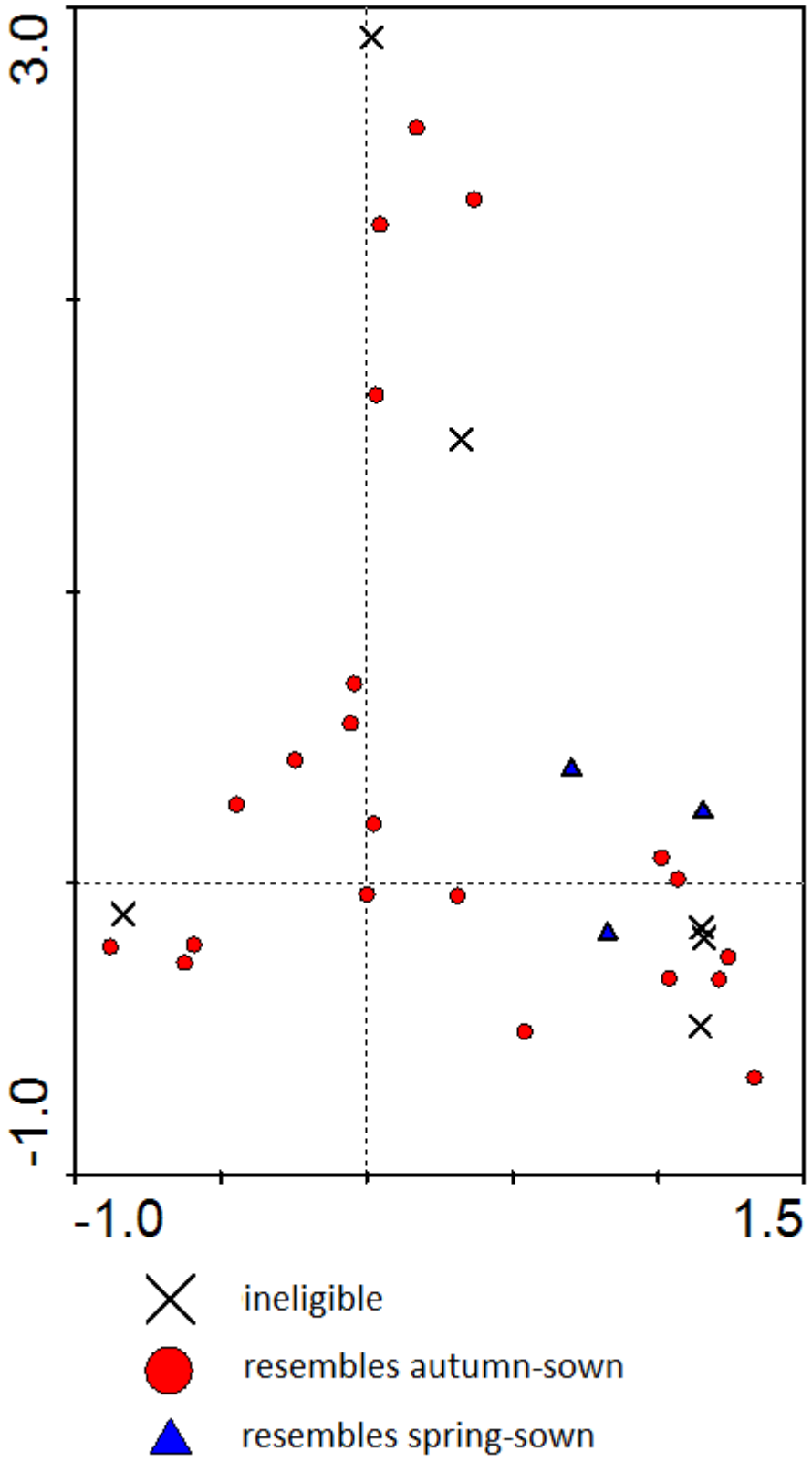


Figure 6.52 – Distribution of samples coded by sowing time indicators (via discriminant analysis of weed seeds).

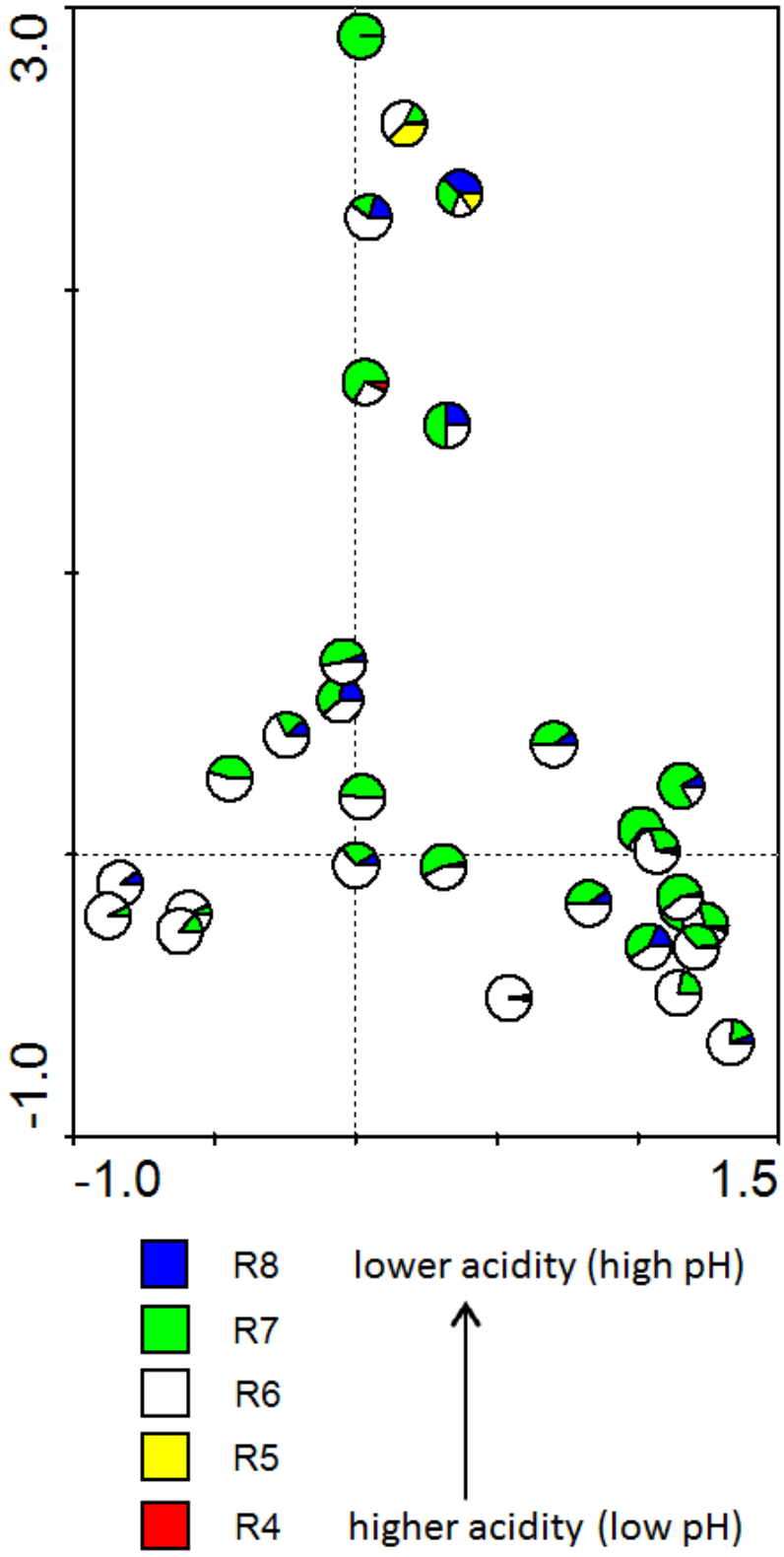


Figure 6.53 – Distribution of samples coded by acidity preferences (Ellenberg numbers for 'Reaction').

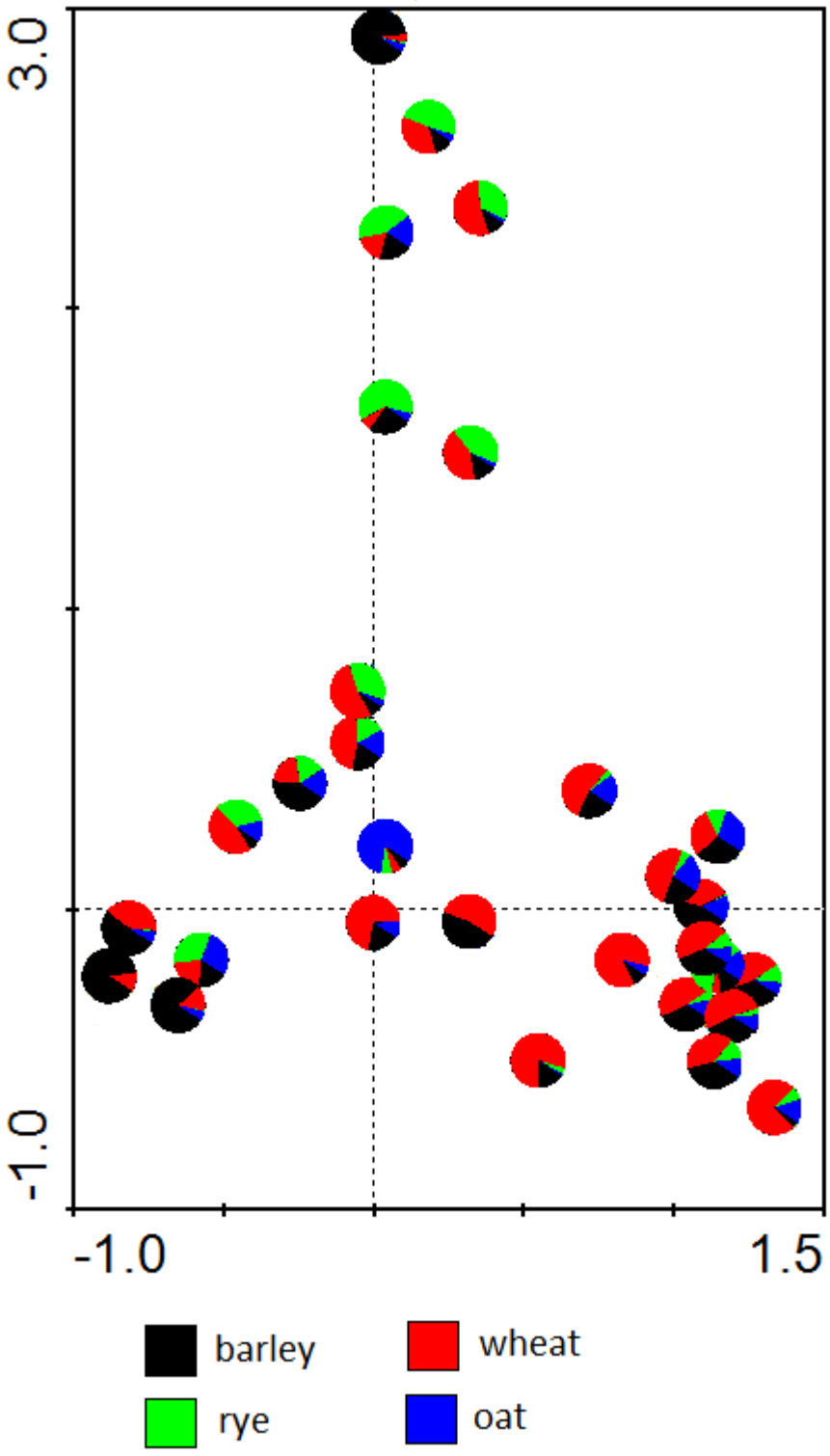


Figure 6.54 - Distribution of samples coded by free-threshing cereal grain contents.

It may be recalled that the product samples from Lyminge and Ipswich, here argued to appear predominantly autumn-sown, are also characterised by a marked heterogeneity of cereal species.[407] The possibility is thus raised that a correlation may exist between crop and weed content in the product samples. In order to explore this possibility further, Figure 6.54 displays the results of the weed- and product-based correspondence analysis, with samples coded by their free-threshing cereal grain contents (including indeterminate *Avena* L.). It thus appears that the samples in the supposed 'spring-sown' cluster contain relatively high proportions of free-threshing wheat (except for the rye-dominated <WFR4>), while the supposed 'sandy' samples towards the positive end of the y-axis tend to be richer in rye grain (except for the barley-dominated <RFT6-7>); the 'autumn-sown' samples exhibit generally greater variety in crop composition.

While it must be stressed that the above interpretations can be made only tentatively, because of the relatively small subset of data being utilized, it is nonetheless possible to propose a meaningful model to explain the emergent patterns. Three main groups of samples have been identified. First, there is an autumn-sown group, particularly associated with Lyminge and Ipswich, characterised by low nitrogen preferences and heterogeneous crop composition. Second, there is a spring-sown group, particularly associated with Yarnton and Ely, characterised by higher nitrogen preferences, slightly higher moisture preferences, and a tendency towards wheat-richness. Stinking chamomile may indicate the use of heavy clay soils in this group, especially perhaps in the Mid Saxon period. Finally, there is a sandy soil group of ambiguous seasonality, with a tendency towards relatively high proportions of rye.

The apparent association between rye and sandy soils is unsurprising: with its extensive roots, drought-resistant rye is suited to well-drained soils. Similarly, free-threshing wheat's

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[407] See above, §6.6.2.

commonly perceived preference for heavier, richer soils is apparently reflected in the weed ecological associations (and perhaps geographical/geological distribution) of the putative spring-sown group.[408] The significance of the seasonality gradient is less clear. As van der Veen notes, spring-sown crops in Britain are potentially disadvantageous, giving a lower yield than autumn-sown crops, 'owing to a reduction in the total photosynthesis', but may be preferred if autumn-sowing is prohibited by a severely cold winter, waterlogging, and/or insufficient labour and a resultant need to spread tasks out over two sowing seasons.[409] Conceivably, then, the presumed heavy clay soils of the Yarnton/Ely group of samples could help to account for the apparent spring-sowing of their wheat-rich crops, with spring-sowing here adopted as a risk-buffering strategy on soils which were more prone to winter waterlogging. Also, as will be discussed in the following chapter, there is circumstantial structural evidence at Yarnton for the need to 'spread out' labour for crop processing tasks.[410]

It may be noted here that this model stands in direct contrast to that proposed by Banham, in which free-threshing wheat is seen as a winter crop which, in order to be cultivated successfully on heavy water-retentive soils, would have benefited greatly from heavy ploughing.[411] Yet although wheat was indeed typically grown as a winter crop later in the medieval period, and barley as a spring crop, these are not necessary requirements of these cereals. Indeed, the one contemporary account to make a passing reference to seasonality in Anglo-Saxon crop husbandry – a hagiographical anecdote recorded by Bede in both his *Vita Sancti Cuthberti* (*c.*AD 721) and *Historia Ecclesiastica* (AD 731) – could be taken to suggest that spring was seen as the proper time ('*tempore congruo*') for sowing both barley *and* wheat, at least on the north-east coast of Northumbria. According to the story, Cuthbert's spring-sown crop of

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[408] Moffett 2006 p.48, Table 4.3.
[409] van der Veen 1992 p.130.
[410] Below, §7.3.3.
[411] Banham 2010, pp.182-187.

wheat failed unexpectedly; the subsequent miracle was an abundant crop of barley, sown much later than its 'proper time'.[412] The implication seems to be that both wheat and barley were expected to yield a reasonable crop, if sown in the spring – an especially desirable strategy, perhaps, in the exposed environment of Cuthbert's hermitage on the Inner Farne island.

Spring-sowing could thus be seen as part of a risk-buffering strategy in environments prone to harsh winters and/or waterlogging. By contrast, in the supposed autumn-sown crops of the Lyminge/Ipswich group of samples, the varied spectrum of cereals could itself represent an alternative risk-buffering strategy on lighter soils, whether directly through maslin cultivation, or less directly through the centralized accumulation of separately cultivated monocrops of wheat, barley, rye and oat.

The adoption of risk-buffering strategies such as these would be consistent with a postulated arable expansion in the Mid Saxon period, with local crop husbandry strategies being adapted to suit more challenging terrains as they were brought under the plough, both in the drier land of East Anglia and Kent, and on the wetter ground of the Oxfordshire clay vales and the inland peat fens.

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[412] *HE* IV.28; *VCB* 19.

6.8 Conclusions

The key arguments presented in this chapter may be summarised as follows. There appears to have been an increase in the scale and/or centralization of cereal production and processing by the 8th-9th centuries, perhaps beginning as early as the 7th century. It is also possible to identify a simultaneous diversification of crop taxa, with possible increases in the cultivation of rye, oat, emmer, grape, hemp, hop, poppy and perhaps lentil, alongside the persistent joint-staples of barley and free-threshing wheat. Besides these innovations, the cultivation of spelt – the staple cereal crop of Roman Britain – is likely to have persisted beyond the early 5th century, initially within continuing 'Very Late Roman' crop husbandry regimes; and by the Mid Saxon period, glume wheats may still have been favoured by some high-status consumers for the purposes of food-rents.

There appear to have been regional variations in the relative importance of different cereal crops by the Mid Saxon period, perhaps in response to geological differences, with *e.g.* barley and rye preferred in sandy regions, wheat preferred in more clayey regions. In addition, there appears to have been some association between clay soils and spring-sowing at Yarnton and Ely, and between crop diversity and autumn-sowing at Lyminge and Ipswich.

Although the limitations of the dataset should be borne in mind (especially the shortage of numerically sufficient samples for the Early Saxon period), it is thus possible to propose a synthetic model for Mid Saxon innovations in crop husbandry. Certain sites – often with some ecclesiastical or high-status associations – appear to have been engaged in an expansion and/or centralization of arable production, embracing both diversification and strategic adaptation (*e.g.* in crop choices and sowing times) to the capabilities and limitations of more 'challenging' local terrains. It may be that these terrains – *e.g.* clays in the Upper Thames valley, sands in the hinterland of Ipswich – were being newly exploited as arable land, or at least exploited on a new, larger scale for the first time since the Roman period. This is not to suggest that agricultural

innovations were somehow restricted by external environmental factors. Rather, it is to argue that Mid Saxon farmers were able to maximize the productive potential of available land through the practical, adaptive management of natural resources.

6.9 Prospect

The charred plant macrofossil data analysed in this chapter constitute the bulk of the project dataset, and support the most original contributions of this thesis to current debate. The theories presented here regarding crop production and processing may be more fully understood, however, through a complementary analysis of structural evidence for crop storage and processing in the following chapter.

In addition, the taxonomic range discussed in this chapter is limited by the biases inherent to charring as a mode of preservation. By way of comparison, Chapter 8 considers archaeobotanical material preserved by other means: waterlogging, mineralization, and ceramic impression.

7 Structural Evidence: Storage & Processing

7.1 Introduction

This chapter considers the structural evidence pertaining to the storage and processing of cereal crops. It comprises a descriptive and interpretative account of possible granaries, barns, grain ovens and watermills of 5th-9th century date in the study regions, whether identified as such in the available literature or else included at the present writer's discretion. The objectives are to critically assess the interpretation, dating, and distribution of such features, and so to determine what patterns may be discerned in their occurrence. The basic hypothesis under consideration is that specialist facilities for the storage and processing of cereals and other arable produce were an innovation of the Mid Saxon period, having generally fallen out of use in the 5th century.

7.2 Storage

This section considers the hypothesis that specialized structures for grain storage – barns, granaries, and comparable buildings – were an innovation of the Mid Saxon period, perhaps a direct consequence of increased arable production. The general heuristic framework of this discussion is borrowed from Sigaut's seminal paper on the identification of grain storage technologies.[413] Archaeological sites mentioned in this discussion are mapped in Figure 7.1.

Distinct grain storage structures are notably scarce among excavated Anglo-Saxon rural settlements, and indeed continue to be rare throughout the medieval period.[414] In their absence, as Hamerow suggests, one may assume that 'unthreshed grain was stored in the rafters of houses, in *Grubenhäuser…* and/or in ricks… and then threshed as the need arose'.[415] By implication, in those rare instances where we *can* identify specialized structures specifically built for grain storage, it could be argued that harvests must have become too large to be accommodated by these less formal means. However, the archaeological identification of specialized storage facilities is not straightforward. Concentrations of charred grain in postholes cannot necessarily be taken as a direct indication of proximate grain-storage; they might alternatively have derived from hearth sweepings, for instance, if grain had been dried or cooked within or just outside the building in question. Such archaeobotanical evidence is more compelling if combined with a distinctive structural morphology suggestive of storage functions. In order to recognize such a specialized morphology, some consideration should first be given to the basic principles behind the storage of harvested grain.

[413] Sigaut 1988.
[414] Gardiner 2011 p.207.
[415] Hamerow 2012 p.50.

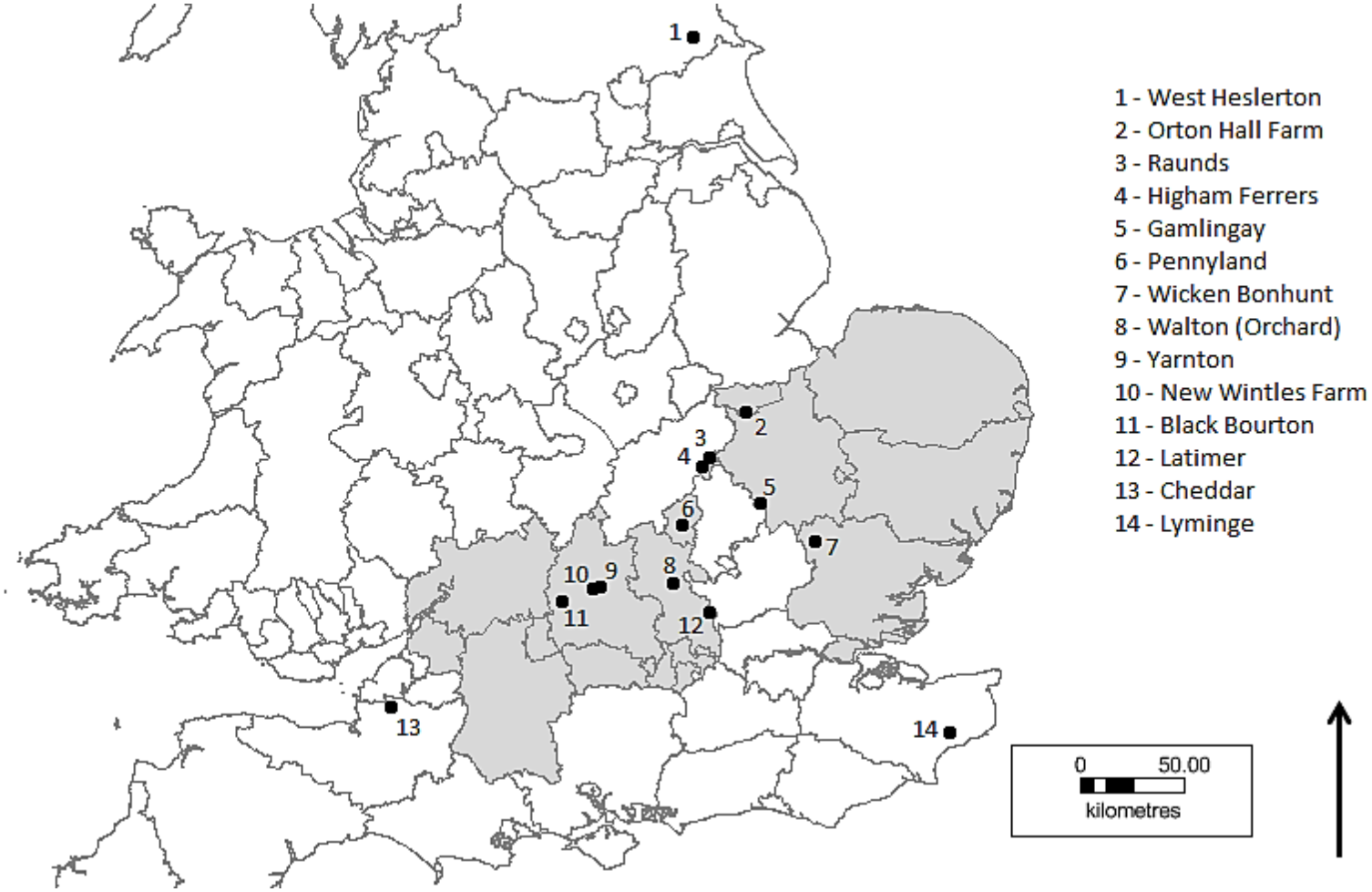


Figure 7.1 – Map of sites mentioned in the discussion of grain storage (Digital Mapping Data © Collins Bartholomew 1995).

7.2.1 Principles of grain storage

The storage of harvested cereals is a specialized operation. Until cooked or milled, harvested grains remain biologically active and measures must be taken, not only to prevent the intrusion of pests such as rodents and insects, but also to inhibit respiration in the grain itself. Otherwise, germination may occur and the resultant warmth and humidity could foster fungal, bacterial or insect spoilage.[416] Grain which has to be stored for extended periods is often therefore subject to some degree of atmospheric control to ensure that it does not become too warm or moist.[417] This end can be achieved, for example, by restricting the supply of air, such as in the hermetically sealed storage pits familiar from Iron Age Britain, or conversely by ensuring that the stored crop is well-ventilated: whether in the open air or in a purpose-built granary with ventilation holes. Granaries or ricks constructed on raised platforms can thus offer the dual advantages of all-round ventilation and, with the addition of 'rat guards' between the granary and its legs, the deterrence of rodents.[418]

An additional consideration is that different cereals can have different storage requirements. Glume wheats, because they remain in their spikelets after threshing, can be stored in spikelet form with the encasing glumes providing an additional barrier to spoilage/infestation.[419] For free-threshing cereals to enjoy a similar advantage, however, they must be stored prior to threshing and winnowing, since it is only in this bulky, unthreshed form (*i.e.* as ears, loose or bundled together into sheaves) that they retain the physical protection of their chaff.[420]

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[416] Lenehan 1986 pp.1–4.
[417] Hence also the use of grain ovens for drying: see below, §7.3.1.
[418] Sigaut 1988 pp.8–12.
[419] Hillman 1981 p.138.
[420] See above, §6.6.1. Sigaut 1988 pp.13–14.

7.2.2 Granaries

Various structures in the study regions have been identified by their excavators as granaries, but largely upon circumstantial, equivocal grounds, and few interpretations are here thought to be convincing. At Gamlingay (CA22), an irregular six-post structure of probable 7th century or later date is said to resemble a granary, [421] although the presence of smithing waste in the postholes and a nearby pit would support an alternative interpretation as a metalworking shed (Figure 7.2A).[422] The granary interpretation appears to be made solely by analogy with a similar structure belonging to the post-villa phase at Latimer (BU19, Figure 7.2B), whose interpretation is in turn based upon a perceived resemblance to structures at Wijster in the Netherlands.[423] There does not appear to be a strong case for identifying either of these structures as elevated post-granaries; they might equally be seen as earth-fast, posthole structures of uncertain, variable function.

Four shallow, four-posted, sunken-featured buildings from Pennyland's latest (8th-9th century) phase are interpreted by the excavator as 'a Saxon form of grain silo, combining the below-ground principles of pit storage with those of the above-ground Iron Age granaries supported on four or more posts' (BU3, Figure 7.2C).[424] Alternatively, but also circumstantially, by analogy with comparable structures at West Heslerton (Yorks), Tipper has suggested that the structures may be latrines.[425] While there is no direct evidence to support either interpretation, it may be noted that the principles of pit storage and those of elevated post-granaries are, *contra* Williams, technically incompatible: pit storage operates by sealing the grain, post-granaries by ventilating it. It remains possible that these structures had grain-storage functions, but only to the

[421] The published report asserts an Early Saxon chronology, but a 7th century or later date would arguably be more consistent for the settlement sequence: Hamerow 2012 p.71, n.3.
[422] Murray 2005 pp.190, 263.
[423] Branigan 1971 p.187.
[424] Williams 1993 p.85.
[425] Tipper 2004 p.85.

extent that ordinary *Grubenhäuser* could have functioned as grain stores, with the sunken void providing a ventilation space beneath a suspended grain-storage floor.

Square structure 130 at New Wintles Farm, approximately dated to the 7th or early 8th century, seems to lack direct parallels elsewhere (OX6, Figure 7.2D). The interpretation of this structure as a granary was put forward by Chadwick Hawkes with little explanation, except for a passing mention of the central post which, presumably, should be seen as a load-bearing feature in an elevated post-granary. Alternatively, Blair has suggested that this structure shows closer affinities with shrines.[426] Since the site remains largely unpublished, direct supporting evidence for either interpretation is lacking. However, if the structure does indeed represent a post-granary, then a more regular arrangement of postholes might be expected, and perhaps also *fewer* posts: the minimum necessary to support the elevated storage unit without providing additional opportunities for rodent access.

These latter criteria are better met by structures at Wicken Bonhunt, Orton Hall Farm, and Yarnton. The rectangular, nine-post structure 'N' belonging to the 8th-9th century phase at Wicken Bonhunt (ES1), and a closely comparable nine-post structure belonging to the post-Roman phase at Orton Hall Farm (CA5), have both been interpreted as granaries or haylofts (Figure 7.2E-F).[427] Unlike the structure at New Wintles Farm, these buildings *do* seem to make minimal use of regularly-spaced posts, well-suited to the efficient elevation of a post-granary. Similarly, Structure B 2734 at Yarnton consists of 25-29 postholes which, in the excavators' preferred reconstruction, constitute one six-post and two nine-post granaries, although other configurations remain possible (OX10, Figure 7.2G). This interpretation was drawn by analogy with Romano-British and early medieval continental examples, as well as those at Orton Hall Farm and Wicken Bonhunt. As in the latter structures, the regular and economical distribution of postholes in B 2734 would

[426] Chadwick Hawkes 1986 p.84; Blair 1995 p.19.
[427] Wade 1980 p.98; Mackreth 1996 pp.89–91.

indeed be compatible with a series or succession of elevated post-granaries.[428] No artefactual or environmental remains were available to assist in dating or interpreting this structure. It is assigned by the excavators to Yarnton's earlier Mid Saxon phase (7th-8th century – 'Intermediate' in the terms of this project) on circumstantial grounds, since the nearest neighbouring features belong to this phase.

To conclude, there is a strong circumstantial case for identifying elevated post-granaries at Wicken Bonhunt, Orton Hall Farm and Yarnton. However, in the absence of any charred plant remains directly associated with any of the relevant features, there is no way of determining exactly what was stored here, and in what form. Indeed, different categories of produce might have been stored at different times in the same structures: *e.g.* 'clean' grain stored in bulk, or spikelets, or whole ears of cereals; or hay, pulses, flax or other crops.

[428] Hey 2004 pp.69, 124–125.

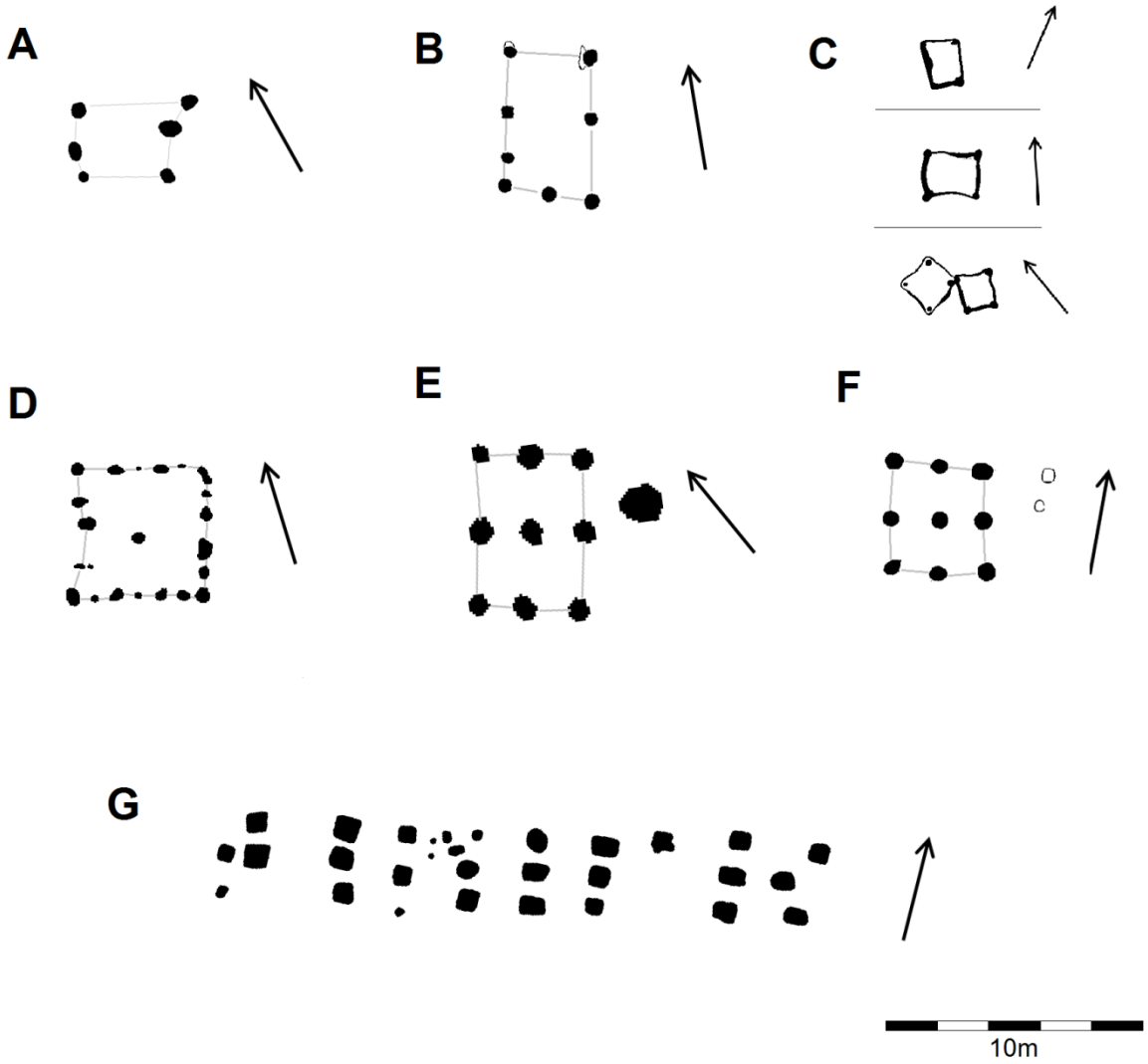


Figure 7.2 – Putative granaries at (A) Gamlingay, after Murray 2005 p.190, Fig. 24; (B) Latimer, after Branigan 1971 p.90, Fig. 22; (C) Pennyland, after Williams 1993 pp.83–84, Fig. 47-49; (D) New Wintles Farm, after Blair 1995 p.17, Fig. 11; (E) Wicken Bonhunt, after Wade 1980 p.97, Fig. 38; (F) Orton Hall Farm, after Mackreth 1996 p.90, Fig.57; (G) Yarnton, after Hey 2004 p.127, Fig. 6.23.

7.2.3 Barns

The term 'barn' is here used, *sensu* Sigaut, to denote a large roofed building in which cereals were stored unthreshed: in the ear, often with the straw still attached and possibly bundled together into sheaves, as in Sigaut's 'North European system'.[429] Barns, in this sense, involve no attempt at atmospheric control, as such. They may incorporate a threshing and winnowing floor, allowing sheaves to be brought down and processed as and when required. They are therefore well-suited to settlements producing cereal harvests so large that their immediate processing would be impractical. As Gardiner has observed, however, the fact that barns do not necessarily have a diagnostic ground-plan renders them difficult to distinguish in the archaeological record, although he does suggest two features which may be considered highly suggestive of barn-type functions: nearby concentrations of charred cereals, and internal post-holes which could indicate a raised floor for storage purposes, such as the central posts in the 'aisled barns' familiar from early medieval rural settlements in the north-west of continental Europe.[430] Within the study regions, possible examples of this type of barn can arguably be found at Yarnton and Lyminge, both belonging to 8th-9th century phases.

Yarnton's hall B 3348 has modest indications of a central internal division (one or two posts), and the nearby enclosure ditches and associated pits produced dense concentrations of charred plant remains, including the unusually dense sample <Y47> from pit 3693 which contained a relatively high proportion of straw; as argued above, this sample may represent burnt sheaves.[431] Hence, although the building lacks the long, narrow form of the continental barns, and is not assigned any special function by the excavator, there is circumstantial evidence to suggest

[429] Sigaut 1988 p.16. In origin, the Old English *bere-ern* denotes a 'barley place': 'barn, n.', OED Online, Oxford University Press. <http://www.oed.com>, accessed June 2013.
[430] Gardiner 2012 pp.28–29; Hamerow 2002 pp.37–38; 2011a p.145.
[431] See above, §6.4.6.

that it may have functioned as a barn.[432] It may also be significant that the structure shares its enclosure with a 'hearth' (3329, possibly a small grain oven)[433] and fence lines which could perhaps have delineated zones for crop processing activities, *e.g.* drying, threshing, winnowing, and sieving (Figure 7.3).[434]

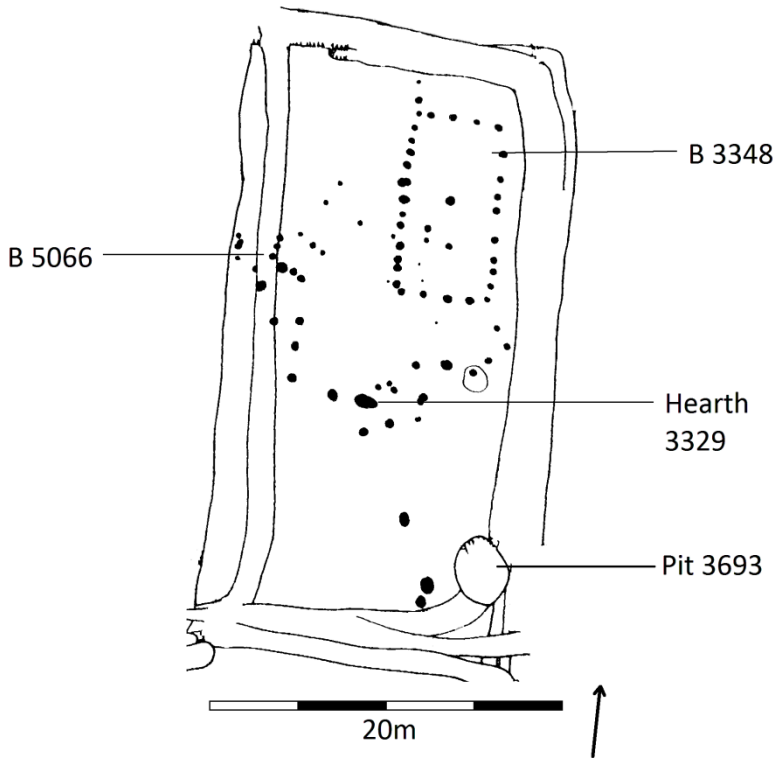


Figure 7.3 – Putative crop storage and processing unit at Yarnton, 8th-9th century – after Hey 2004 p.154, Fig. 7.13.

Similarly at Lyminge (Figure 7.4), a possible aisled barn lies immediately adjacent to context 163, a roughly rectangular surface metalled with crushed flint, provisionally interpreted as a threshing floor;[435] a shallow, waisted feature [159], which could represent a grain oven;[436] and several grain-rich samples of charred plant remains including one, sample <LYM24> from context

[432] Thus also Gardiner 2012 p.29; *cf.* Hamerow 2002 pp.37–38.
[433] See below, §7.3.3.
[434] Hey 2004 pp.148–152.
[435] Thomas 2009 pp.6–7 proposes the identification of a barn and threshing floor.
[436] Present writer's interpretation (see below, §7.3.3), in consultation with G. Thomas and A. Knox.

[49], with a relatively high proportion of straw which could indicate the storage of cereals in sheaves.[437]

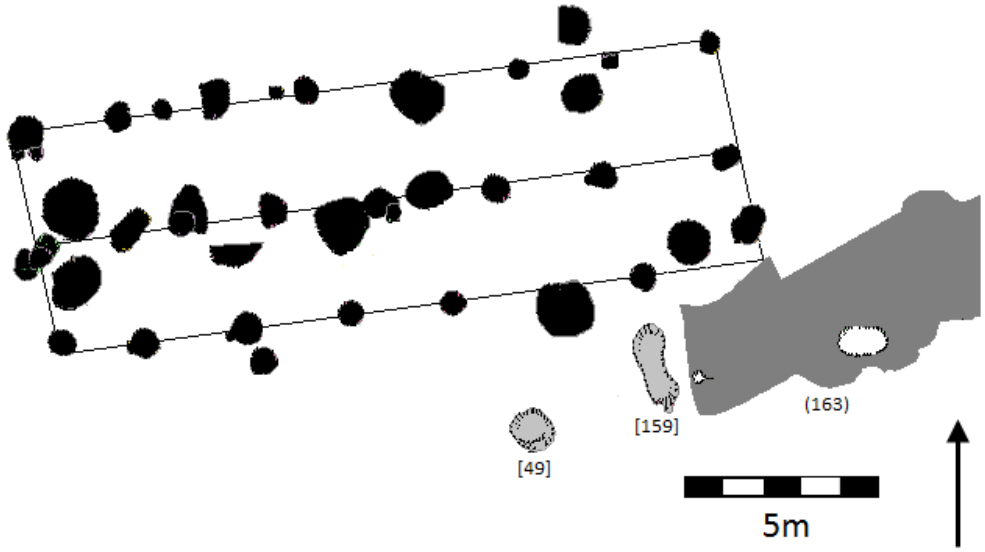


Figure 7.4 – Putative crop storage and processing unit at Lyminge, 8th-9th century – after *Lyminge Archaeological Project* Archive.

Given the high-status, ecclesiastical associations of Lyminge and perhaps also Yarnton, it is interesting to note that the only other comparable Mid Saxon 'barn' structures identified by Gardiner are at the putative tribute collection centre at Higham Ferrers (Northants), of late 7th to early 9th century date, and at the estate centre complex at Bishopstone (East Sussex), of 8th-10th/11th century date.[438] It therefore seems plausible that barns were an innovative feature of some estate centres from around the 8th century onwards, sometimes – with ovens and threshing floors – forming part of larger crop-processing units within zoned settlement plans.

[437] See above, §6.4.6.
[438] Gardiner 2012 p.29; citing Hardy *et al.* 2007 and Thomas 2010.

7.2.4 Outdoor storage

Yarnton's circular, concentric posthole structure B 3624, 10.1m in diameter, is tentatively interpreted by the excavators as a fowl house or possibly a dovecote (Figure 7.5).[439] The fowl house interpretation is drawn by analogy with a smaller circular structure at the Late Saxon complex at Cheddar (Somerset) which, according to Rahtz, may represent a fowl house surrounded by a circular run, with ancillary buildings to either side (Figure 7.6). This interpretation was in turn based upon the structure's perceived resemblance to fowl houses on the idealised monastic St. Gall plan from 9th century Francia.[440]

B 3624 produced no finds and was assigned to Yarnton's 7th–8th century phase on circumstantial grounds, although a later 8th-9th century date also appears possible.[441] The published interpretation as a fowl house is entirely conjectural, and it is suggested here that helms – open-air crop-storage facilities consisting of elevated platforms upon which harvested crops are stacked or thatched – may provide a closer parallel (Figure 7.7).[442]

[439] Hey 2004 p.69.
[440] Rahtz 1979 pp.129–132.
[441] Hey 2004 pp.109–114.
[442] This conclusion was also independently reached by Mark Gardiner (Gardiner 2012). I am grateful to Dr Gardiner for sharing his work with me in advance of publication.

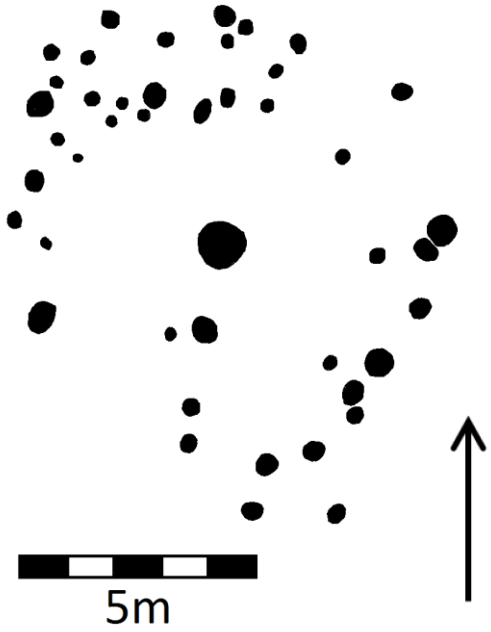


Figure 7.5 – Circular 'fowl house' structure B 3624 at Yarnton – after Hey 2004 p.113, Fig. 6.9.

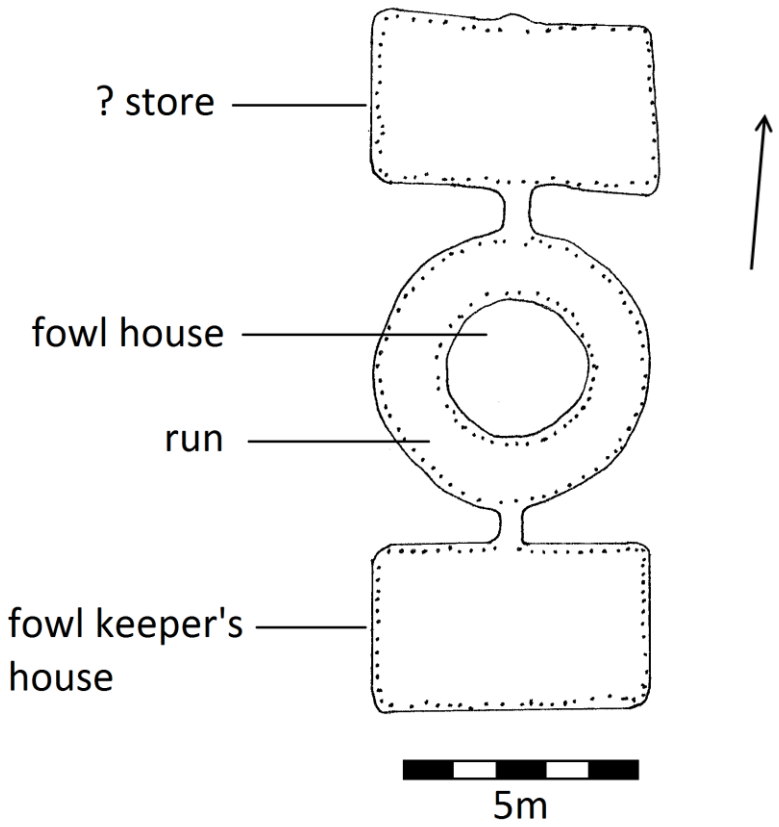


Figure 7.6 – Plan and conjectured interpretation of 'fowl house' at Cheddar – after Rahtz 1976 p.83, Fig.2.16.

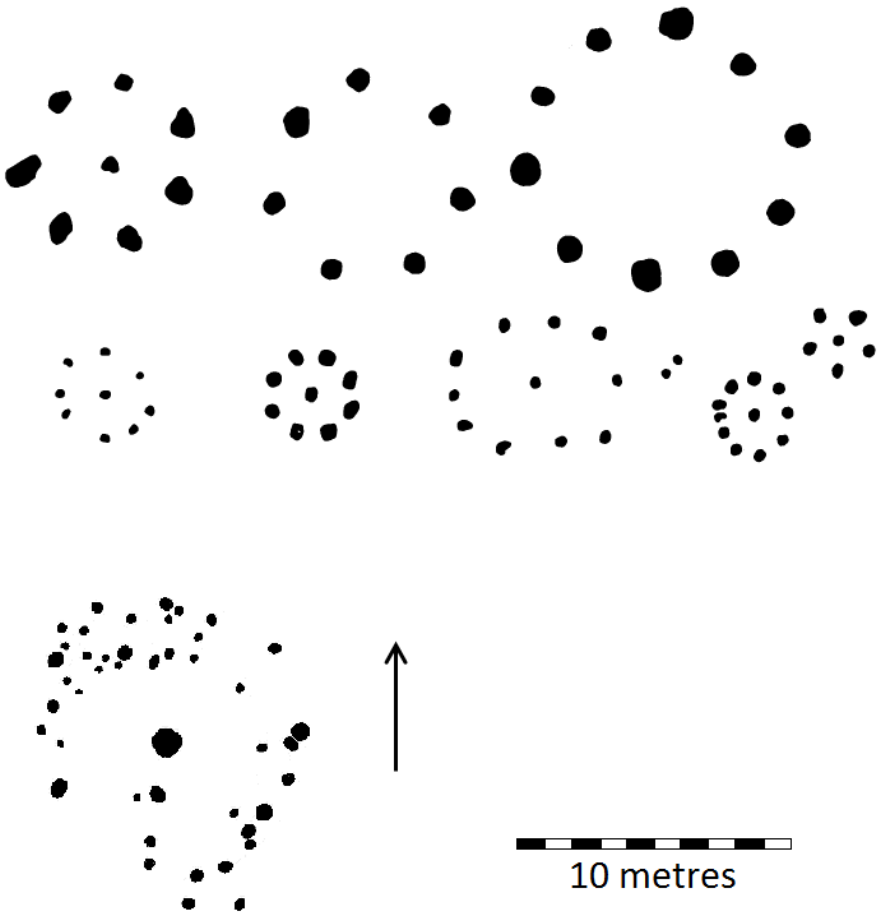


Figure 7.7 – Comparison of Yarnton structure B 3624 (bottom left) with helms identified in Germany and the Netherlands – after Zimmermann 1992 p.36, Fig.2.

Helms are more familiar finds in German and Dutch archaeology but, as demonstrated by Gardiner, possible examples can be found in medieval England, of which Yarnton's B 3624 and a smaller, near-contemporary structure from Raunds (Northants) are perhaps the earliest yet identified.[443] Technologically comparable structures in post-medieval England are known from documentary sources.[444] The basic principle is that cereals, hay, or other suitable crops are stacked or thatched upon an outdoor elevated platform, sometimes beneath an adjustable roof and/or around a central post, until removed for processing or consumption. Unlike barns, helms provide no shelter for insects and vermin, and therefore the sheaves should in theory be less

[443] Zimmermann 1992; Gardiner 2012 p.27.
[444] Airs 1983; Dyer 1984.

susceptible to pest damage. Additional protection could be afforded by stacking the sheaves with the ears facing inwards and the straw facing outwards.[445] A potential disadvantage of this mode of storage is that, depending upon the precise manner of construction, it may be impossible to remove only a portion of the stack for threshing. Rather, once broken into, the whole store might have to be threshed and either consumed or removed to alternative storage facilities prior to further processing, thus demanding a considerable input of labour. Sigaut suspects that the stack originated as 'an occasional addition to the barn for exceptionally plentiful harvests'.[446] Hence, the stack may plausibly be seen as an innovation directly related to agrarian growth, requiring high labour investments and responding to the needs of increasing productivity.

It has not been possible to identify any other directly comparable structures at Early/Mid Saxon sites in the study regions although, considering their ephemeral nature, the apparent scarcity of helm-type structures in the archaeological record is unsurprising. Circular or sub-circular arrangements of postholes can be especially difficult to recognize amongst an accumulated cluster of other postholes. There is even some ambiguity within Mid Saxon Yarnton. Structure B 3619 is described by the excavators as rectangular or sub-rectangular, but there is sufficient apparent circularity in its plan for it to be mistaken for the 'fowl house' in a recent reproduction of the site plan.[447] The close proximity of both of these circular structures to rectangular post-built structures (B 3620 and B 3659 respectively) perhaps recalls Sigaut's model, in which stacks were used to store the 'overflow' from barns – although admittedly these particular rectangular buildings have no distinct morphological indications of barn-type functions (Figure 7.8).

[445] Sigaut 1988 pp.16–17; Zimmermann 1992; Gardiner 2012 pp.24–25.
[446] Sigaut 1988 p.16.
[447] Hamerow 2012 pp.97–98, Fig.3.18.

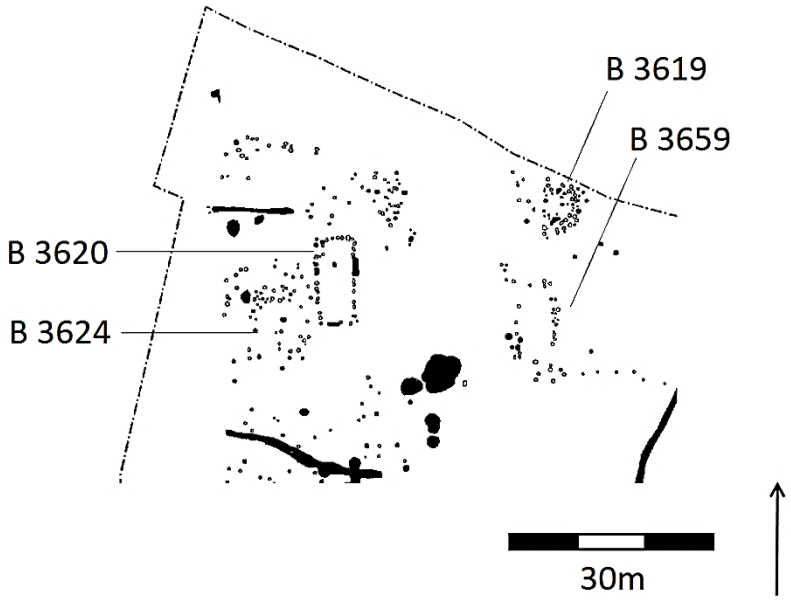


Figure 7.8 – Detail from the plan of Yarnton (Phase 2, 7th-8th centuries) – after Hey 2004 p.107, Fig.6.2.

The functions and dates of other circular structures can be similarly difficult to determine. There seem to be circular or semi-circular arrangements of postholes at the Walton Orchard site, probably of 7th century or later date (Structures A, B & D; Figure 7.9), but their interpretation is impeded by the presence of overlapping rectilinear structures . Two small, circular post-hole structures with central pits (PBS 4-5) have also been identified at the high-status 8th-9th century settlement at Black Bourton (Oxon). Although these structures have been interpreted as shrines,[448] their general morphology might be considered consistent with a stack, rick or helm-type structure, with the interior pits perhaps intended to aid ventilation, drainage, and/or pest-deterrence (Figure 7.10).

[448] Gilbert 2009 pp.155–156.

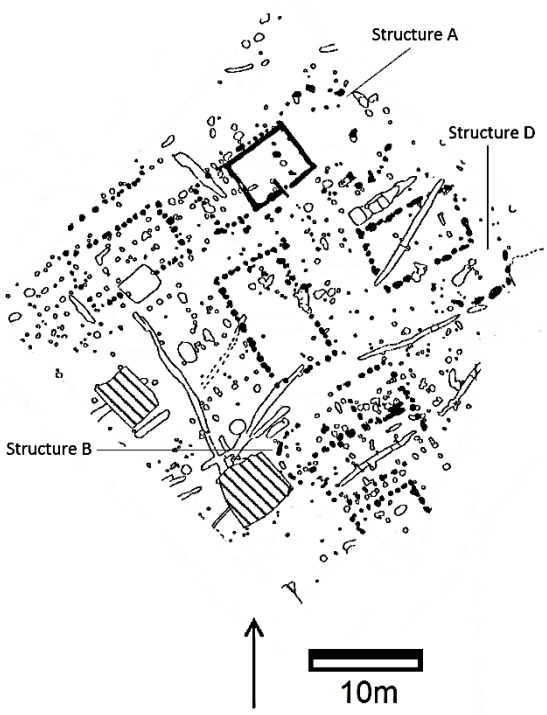


Figure 7.9 – Excavated Early/Mid Saxon features at the Walton Orchard site – after Ford & Howell 2004, p.62, Fig.3.2.

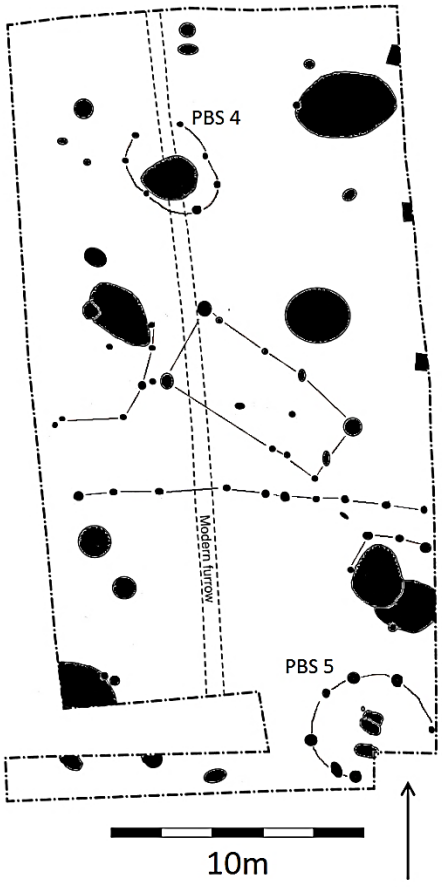


Figure 7.10 – Excavated Mid Saxon features at Black Bourton, Oxon – after Gilbert 2009 p.149, Fig.2.

7.3 Grain ovens

This section considers the hypothesis that (i) grain ovens fell out of use in the 5th century, only to reappear in the Mid Saxon period, and (ii) that the substantial capacity of the new Mid Saxon ovens 'implies a new need for centralized cereal processing on a large scale'.[449] The study of grain ovens in British archaeology has been somewhat neglected in recent decades, with the last major syntheses appearing in the 1970's.[450] In the absence of any definitive recent study, therefore, some consideration should first be given to the functional operation and archaeological recognition of grain ovens.

The term 'grain oven' is here used as a synonym for the various overlapping and interchangeable terms encountered in the literature, the most common of which are *corn dryer*, *corn-drying oven* (or *kiln*), *corn oven, drying floor, drying kiln,* and *malting oven* (or *kiln*). While not in widespread use, the more neutral term 'grain oven' is here preferred because it allows for the multiplicity or ambiguity of cereal-processing functions that seems to characterize these structures. In short, we may define a grain oven as a structure which applies non-culinary heat-treatment to cereal grain. Hence, the category does not strictly include baking ovens, although in practice we are unlikely to be able to make an archaeological distinction between baking and pre-culinary functions, or between the heat-treatment of cereals and that of other crops, *e.g.* flax.

7.3.1 Functions and identification

Several ovens, kilns, hearths and similar structures occur within the study regions. Our primary concern here is with those whose morphology would be consistent with specialized grain oven functions. The various possible functions of grain ovens have been collated by van der Veen,

[449] Hamerow 2012 p.151.
[450] Morris 1979 on Romano-British examples; Rickett 1975 covering the post-Roman and medieval periods. The evidence from early medieval Ireland has been studied more recently by Monk & Kelleher 2005.

and fall into three basic categories: *drying*, *malting*, and *parching*.[451] Of these, malting is the most straightforward process to understand: germinated grains are roasted ('cured') in hot air, a process which ends germination without destroying the enzymes required for fermentation, and thus produces malt for brewing. Archaeobotanically, it may be represented by charred sprouting grains and/or loose embryos. Secondly, the drying of cereal grain (and, in theory, other crops too) can occur at a number of stages in the crop processing sequence. It may take place immediately after the harvest, if a wet summer and a short growing season have prevented the crops from becoming fully ripe and hard for threshing. It may also occur after threshing and winnowing but prior to storage, lest moist grain continue to respire and perhaps germinate in storage. Again, it may be dried immediately prior to milling, because dried, hardened grain is quicker and easier to grind.[452]

Finally, parching is a slightly more complicated issue. It concerns the grains of glume wheats, whose additional processing stage – dehusking – is often thought to be greatly facilitated if the crop is first parched in a grain oven, and the chaff thus made brittle. A critical review of historical, archaeological and experimental data, however, has suggested that parching is not, in fact, strictly necessary for efficient dehusking.[453] This is not to suggest that grain ovens were never used for parching. Rather, it is to warn against assuming a direct correlation between glume wheat cultivation and the need for grain ovens.

It should be noted that all of these functions, especially drying, could be performed without the use of a grain oven. Fenton's ethnographic studies on modern Orkney and Shetland witnessed small-scale grain-drying undertaken in round-bottomed pots suspended over fires, or else achieved by rolling heated stones into a container full of grain. Such small-scale, domestic grain-

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[451] van der Veen 1989 pp.303–304.
[452] See above, §7.2.1. Lenehan 1986 pp.1–8; van der Veen 1989 pp.303–305; Moffett 1994 p.61.
[453] See above, §2.3. Nesbitt & Samuel 1996 pp.42–48; Peña-Chocarro & Zapata 2003 pp.105–108.

drying technologies, comparable to those envisaged by Hamerow for the Early Saxon period, would not leave a distinctive archaeological trace.[454]

The presence of purpose-built grain ovens indicates the inadequacy of such domestic-scale technologies for a settlement's grain processing requirements. However, the archaeological recognition of such ovens is not always straightforward. Evidence of burning is basic to their identification, but may be minimal if the feature has been severely truncated or disturbed. Concentrations of charred plant remains may be considered more directly indicative, but it cannot be assumed that these will always have survived or be recovered. Conversely, even where charred plant remains are present, they are not necessarily exclusively indicative of grain oven functions, but could simply represent fuel or kindling used in other types of oven or hearth.[455]

The main criteria used here for identifying grain ovens are morphological, devised on the grounds that drying and malting require the application of a relatively *gentle* heat, as opposed to the higher temperatures that may be required for cooking and/or parching.[456] This requirement can be met by an oven in which the heating chamber is separate from the stoking area, with the two connected by a flue.[457] Hot air travels from the stoking area, along the flue, and circulates in the heating chamber. The grain lies on a drying/malting floor, or *kiln hair*, directly above the heating chamber, where it may be shovelled to ensure that the entire batch is heated evenly (Figure 7.11).

[454] Fenton 1978 p.375; Hamerow 2012 p.151.
[455] Moffett 1994 pp.59–60.
[456] See Nesbitt & Samuel 1996 p.45 for the possibility that the parching of glume wheats, being more akin to cooking than to drying, would have required higher temperatures.
[457] This account, and the terminology employed, draw upon Rickett 1975 pp.1–2, 19–28.

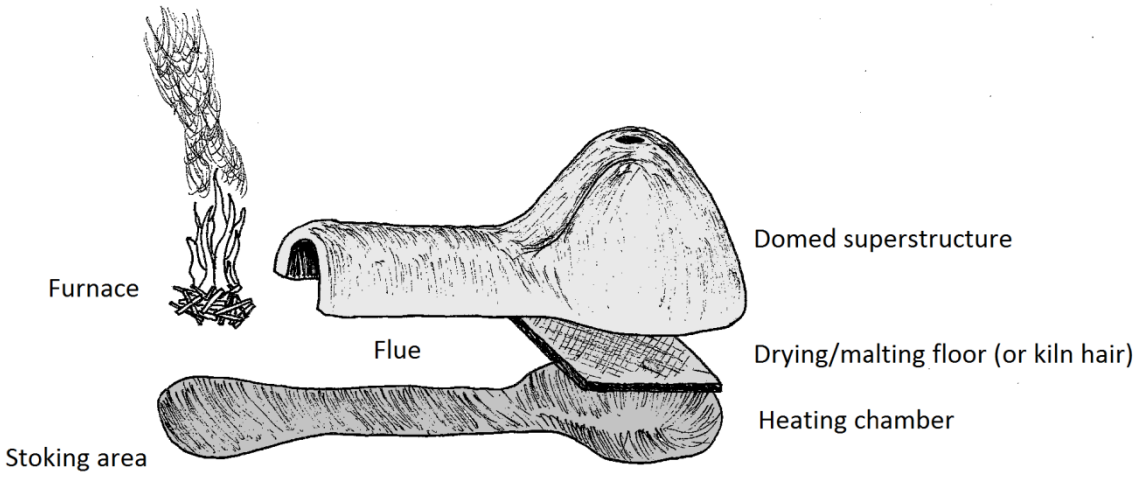


Figure 7.11 – Schematic diagram of the functional elements of a grain oven.

The flue and heating chamber normally survive archaeologically as hollows dug into the contemporary ground surface, sometimes lined with clay, rubble, stones, or built up with masonry walls. The stoking area may also be represented by a bowl-like feature, but in other cases is poorly defined. Shorter flues might also be poorly defined such that, in smaller and simpler grain ovens, the stoking area and heating chamber can appear almost adjacent.

Elements of the superstructure, such as drying/malting floors, typically leave little or no archaeological trace, but ethnographic observations and experimental reconstructions may give some idea of what is practicable. Drying floors may be solid (*e.g.* stone), as in the Romano-British replicas created by Reynolds and Langley at Butser Ancient Farm, who found that their ovens were inefficient at drying grain but could produce satisfactory malt for brewing.[458] Alternatively, a more permeable drying floor could be constructed by covering a wooden framework with straw or haircloth – hence the term *kiln hair* – which, in experimental reconstructions by Kelleher (in Ireland) and the Canes (in Staffordshire), has been found to be suitable for efficient grain-drying.[459] Kelleher's findings also suggest that a flue length of roughly 1.8 metres should be

[458] Reynolds 1981 pp.36–43.
[459] Monk & Kelleher 2005 p.93; Moffett 1994 pp.61–62.

sufficient to prevent sparks from the stoking area from igniting the contents of the drying chamber, whereas a shorter oven may require a baffle stone or curving flue to obstruct such wayward sparks.[460]

Having set out these basic principles, the discussion may now return to the working hypothesis – that large, purpose-built grain ovens fell out of use between the 5th and 7th centuries – and examine it in the light of the potential grain ovens recorded in the study regions, *i.e.* features whose morphology could fulfil the criteria set out above. For ease of comparison, all plans have been redrawn to the same scale. Sites mentioned in the discussion are mapped in Figure 7.12.

[460] Monk & Kelleher 2005 p.102; Rickett 1975 p.1.

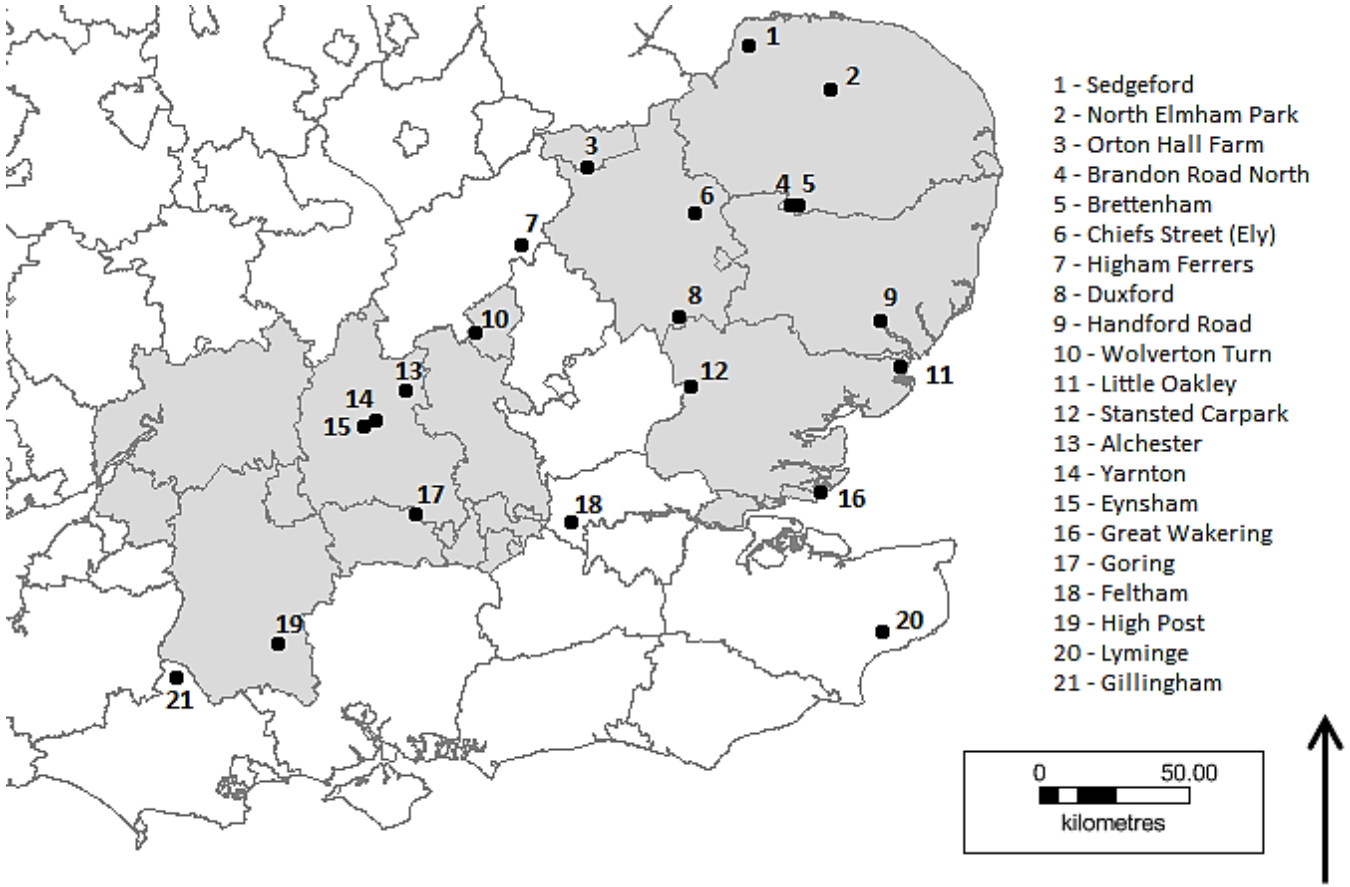


Figure 7.12 – Map of sites mentioned in the discussion of grain ovens (Digital Mapping Data © Collins Bartholomew 1995).

7.3.2 Monumental masonry ovens

The least ambiguous and arguably most significant structures are the large, stone-built oven substructures which are most familiar in Romano-British archaeology but which have also been identified in Mid Saxon England. No such monumental masonry ovens of Mid Saxon date have yet been identified within the study regions. There are, however, two examples lying between the two study regions: at Higham Ferrers (Northants) and Feltham (Middlesex). The oven at the supposed royal tribute-collection centre at Higham Ferrers, lying *c.*100m from the enclosure complex, produced charred plant remains indicative of malting,[461] including grain which returned radiocarbon determinations of cal.AD 662-1014 at 95% confidence. The excavators suggest that the oven is contemporary with the latest phase of the enclosure complex, late 8th to early 9th century (Figure 7.13).[462] At Feltham, the stone-built 'corn drier' (Figure 7.14) and a clay 'hearth' 25m away (not illustrated) were the principal Anglo-Saxon features at a highly truncated site. Charred plant remains from the 'corn drier' were radiocarbon dated to cal.AD 550-775, charcoal from the 'hearth' to cal.AD 665-910 and 920-955 (all at 95% confidence).[463] The dimensions of these ovens, including Feltham's clay 'hearth', are significant. They are extremely large, far larger than the Romano-British masonry ovens discussed below. Moreover, despite their differently shaped flues (L-shaped at Feltham, straight and tapering at Higham Ferrers), they have heating chambers of a very similar large size, approximately 2.5 x 3m. The morphometric similarity extends also to another southern British oven of similar date: the first in a sequence of late 7th–early 8th century ovens at Gillingham (Dorset) which could plausibly have functioned as grain ovens (Figure 7.15).[464] The possibility is thus raised of a degree of standardization in monumental grain oven construction, perhaps commissioned from itinerant specialist builders. However, no further examples of comparable size and shape are known to the author. Large grain

[461] See above, §6.6.3.
[462] Hardy *et al.* 2007 pp.48–54.
[463] Howell 2007 pp.9–10.
[464] Heaton 1993.

ovens of similar date occur elsewhere in Mid Saxon England (*e.g.* Hereford, Sherburn, Hoddom), as well as early medieval Ireland, but none shares the apparent morphometric uniformity proposed here, even where clearly monumental, *e.g.* at Hoddom (Dumfries); no excavated grain ovens from Carolingian Europe are known to the present writer.[465]

[465] Shoesmith 1982 pp.30–32; Powlesland 2011 pp.6–7; Holden in Lowe 2006 pp.100–106; Monk & Kelleher 2005.

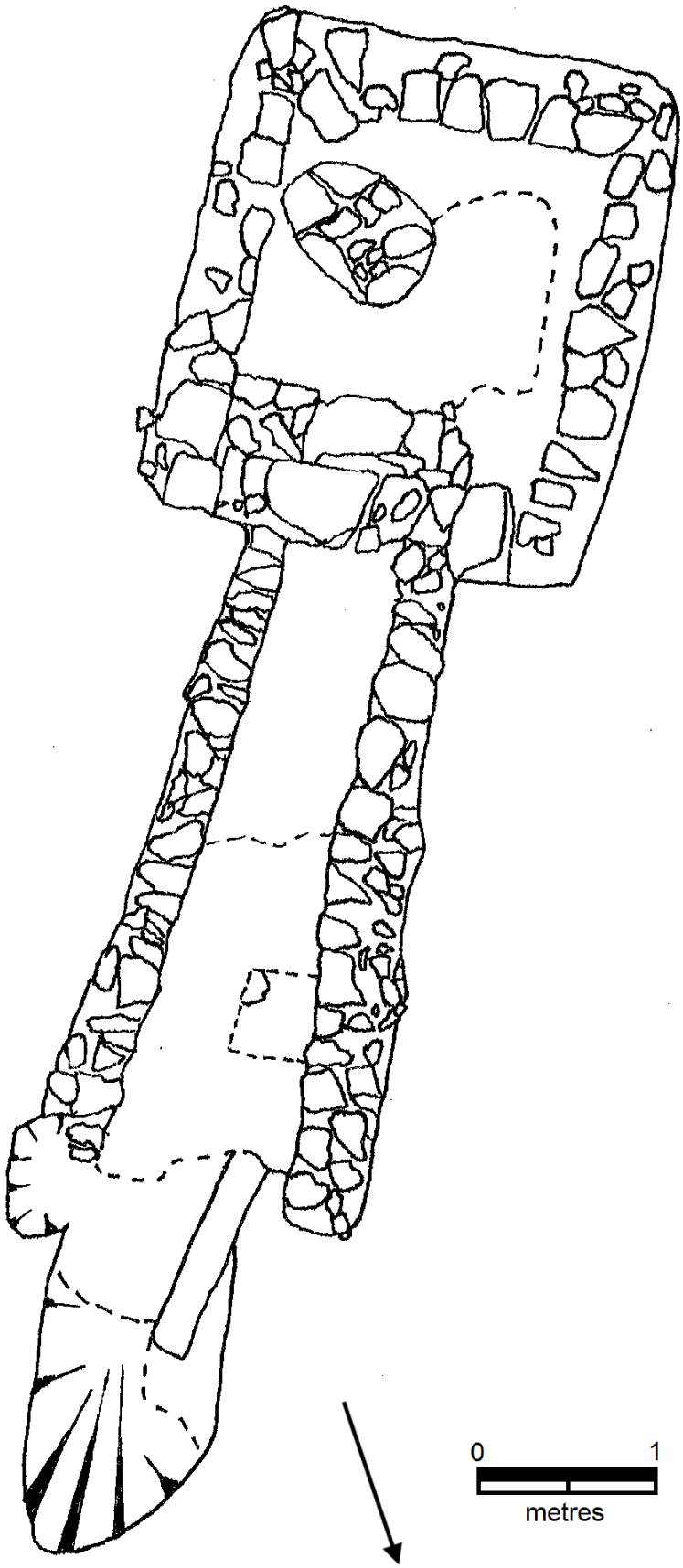


Figure 7.13 – Plan of oven at Higham Ferrers – after Hardy *et al.* 2007 p.52, Fig.3.33.

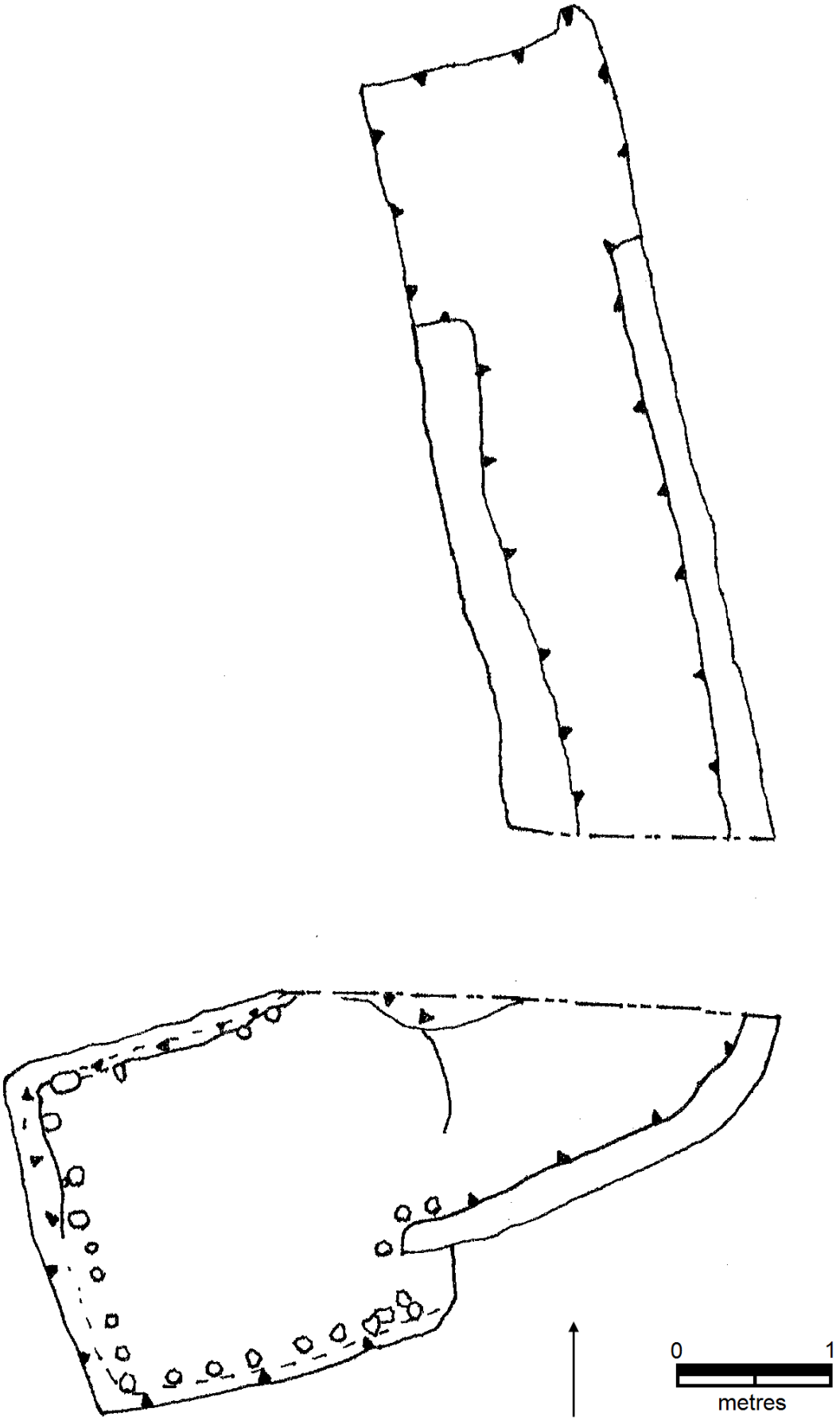


Figure 7.14 – Plan of oven at Feltham – after Howell 2007 p.10, Fig.4.

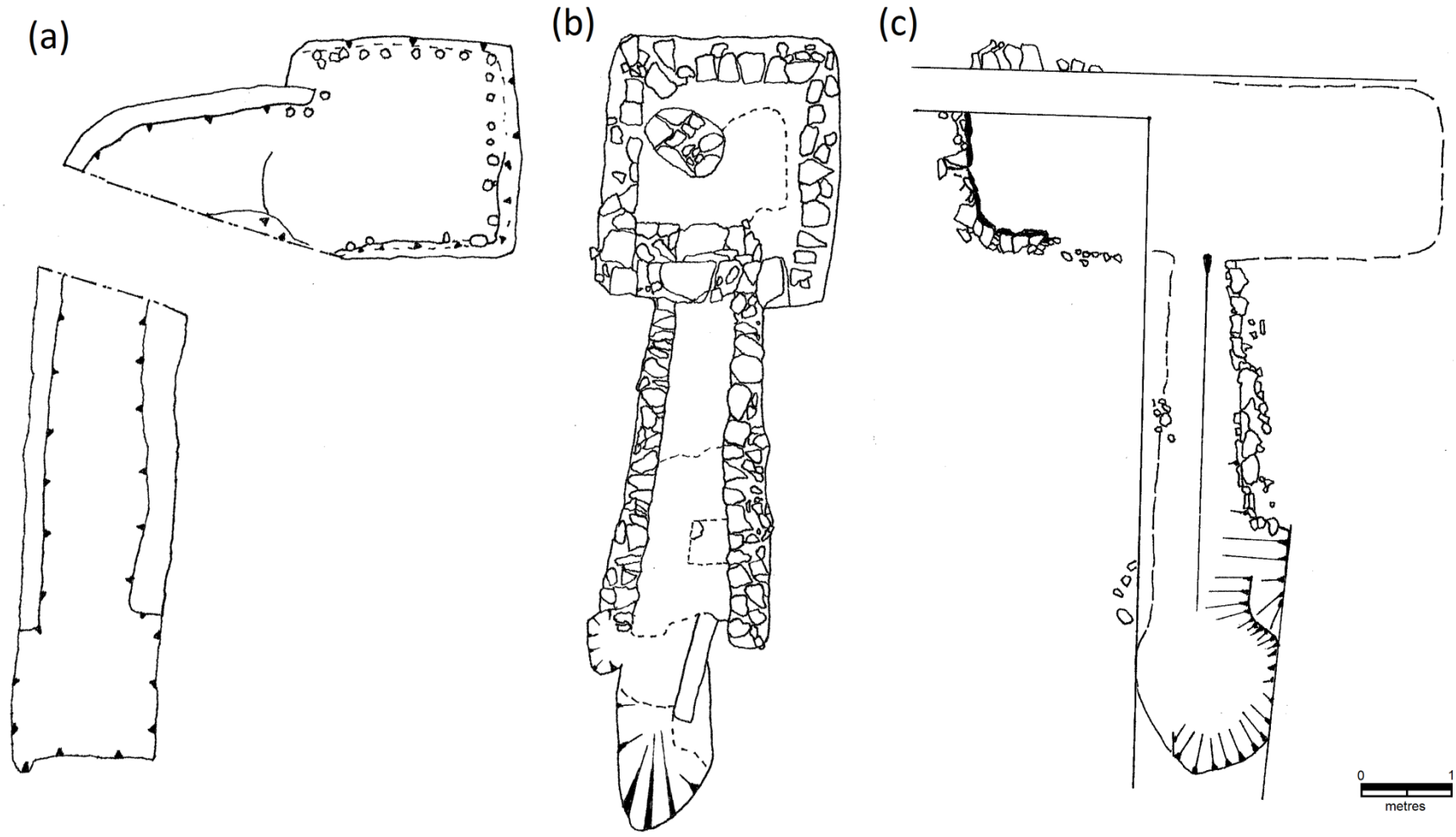


Figure 7.15 – Comparison of plans of grain ovens at (a) Feltham, (b) Higham Ferrers, and (c) Gillingham – after Howell 2007 p.10, Fig.4; Hardy *et al.* 2007 p.52, Fig.3.33; Heaton 1993 p.104, Fig.4.

At the other end of the chronological sequence, it is supposed that large masonry Romano-British grain ovens fell out of use by, or within, the 5th century. Certainly, no comparable ovens have yet been found at Early Saxon settlements. In the study regions, however, five examples have been found of Late Roman grain ovens that may have continued in use beyond the conventional cut-off date of *c.*AD 410, and which could therefore represent a poorly understood 'Very Late Roman' phase of agricultural activity, as proposed above with regard to glume wheat cultivation.[466] Three of these ovens exemplify the well-known T-shape: at Alchester (OX3), Goring (OX20) and High Post (WL8). In this design, the stem of the 'T' represents the principal flue and heating chamber, while the arms are perhaps best interpreted as terminal flues allowing the passage of heated air out of the oven. A fourth oven at Orton Hall Farm (CA5) is of 'reversed tuning fork' plan, a development of the T-shape in which the terminal flues have been extended backwards, presumably to create a larger surface for drying/malting. Finally, the 'drying building' at Duxford (CA29) is more idiosyncratic in plan, with a curving C-shaped flue over which a large drying surface could have been constructed.

The pertinent chronological evidence is different at each site. At Alchester, the case is wholly circumstantial: a nearby deposit of charred plant remains (sample <AL1> in this project), plausibly derived from the oven, was stratified above Anglo-Saxon pottery and alongside burnt stone which might likewise have derived from the oven (Figure 7.16). Precise dating evidence for this deposit is lacking, although a single stamped sherd and a lack of organic tempered wares in this phase might support a *terminus ante quem* in the 5th-6th centuries.[467] At Goring, a decorated Early Saxon sherd (said to be of late 5th-6th century type) was found in the oven's destruction layers, leaving open the possibility that it continued to function, or at least stand, into the 6th

[466] See above, §6.6.1.
[467] Booth *et al.* 2001 pp.202–207.

century (Figure 7.17).[468] At High Post, 'Very Late Roman' usage is potentially indicated by the presence of a pedestal base of 5th-6th century type from the oven, and also charred grain from the base of the flue with a radiocarbon determination of cal.AD 335-535 (Figure 7.18). An unburned skull placed within the oven sometime after its final use returned a radiocarbon date range of cal.AD 250-410; the excavators suggest that it may have been curated and redeposited, therefore pre-dating the terminal use of the oven.[469] At Orton Hall Farm, the oven is attributed to the final phase of activity at the site, which spans the Late Roman and Early Saxon periods (Figure 7.19).[470] Perhaps the most tenuous case is that of the Romano-British 'drying building' at Duxford where, although there is no direct evidence for post-AD 410 usage from the structure itself, the Anglo-Saxon features at the site appear to respect its position and alignment (Figure 7.20).[471]

[468] Allen *et al.* 1995 pp.39–44.
[469] Powell 2011 pp.29–33.
[470] Mackreth 1996 pp.75–8.
[471] Lyons 2011 p.91.

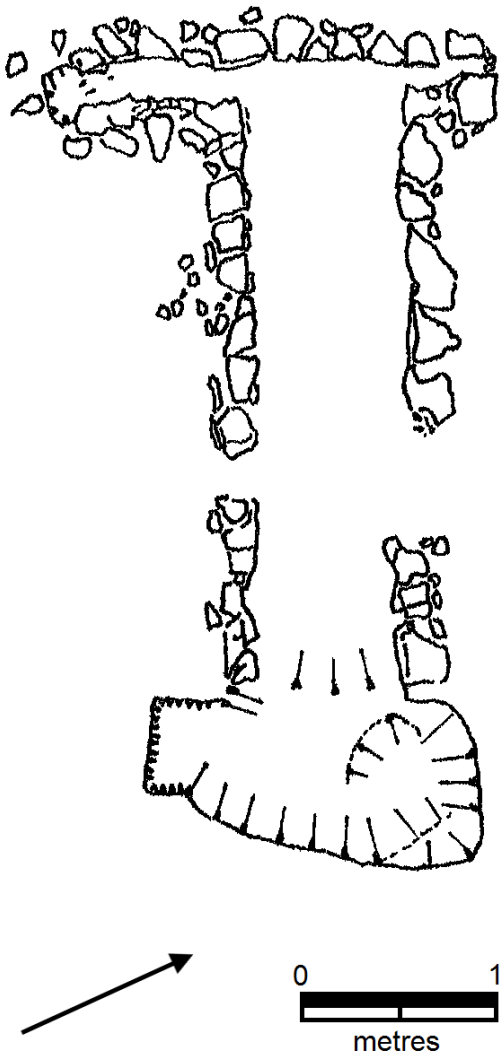


Figure 7.16 – Plan of oven at Alchester – after Booth *et al.* 2001 p.150, fig.5.81.

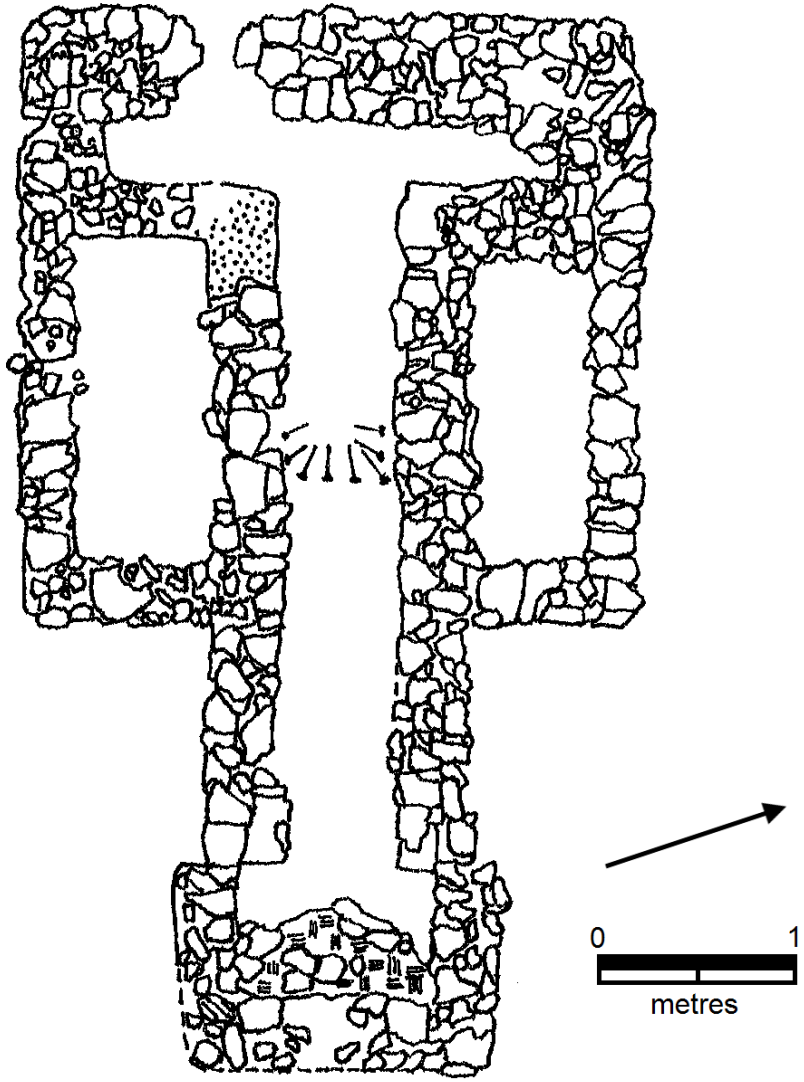


Figure 7.17 – Plan of oven at Goring – after Allen *et al.* 1995 p.41, fig.30.

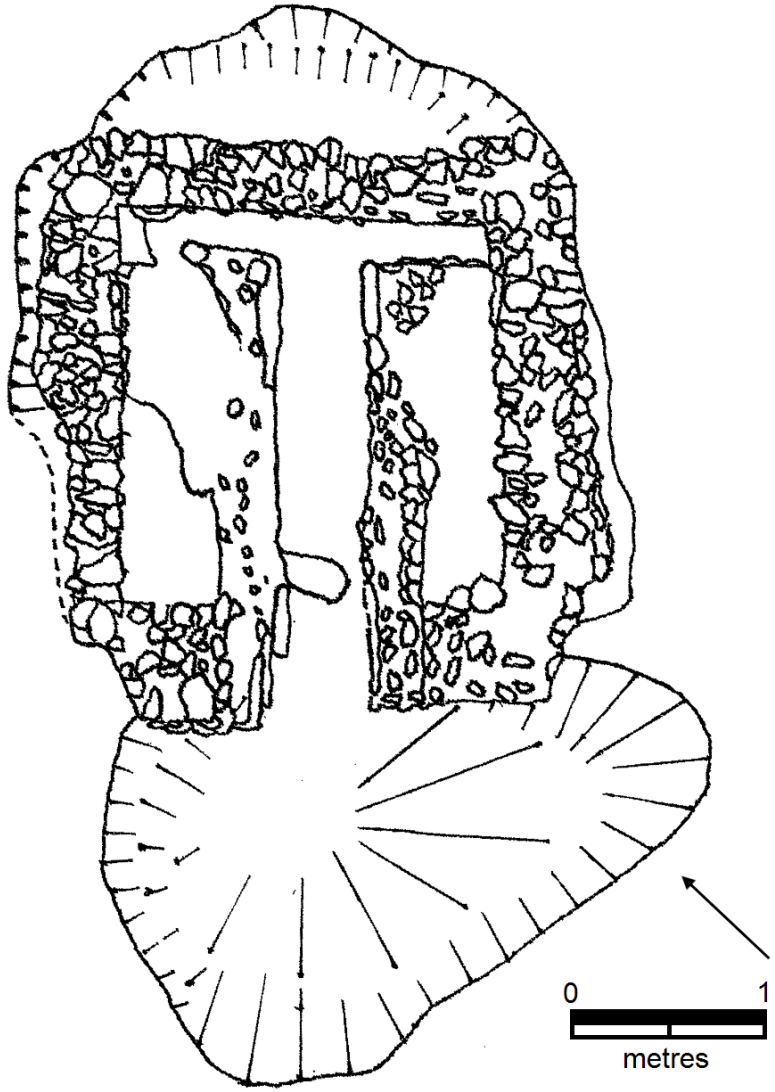


Figure 7.18 –Plan of oven at High Post – after Powell 2011 p.30, Fig.17.

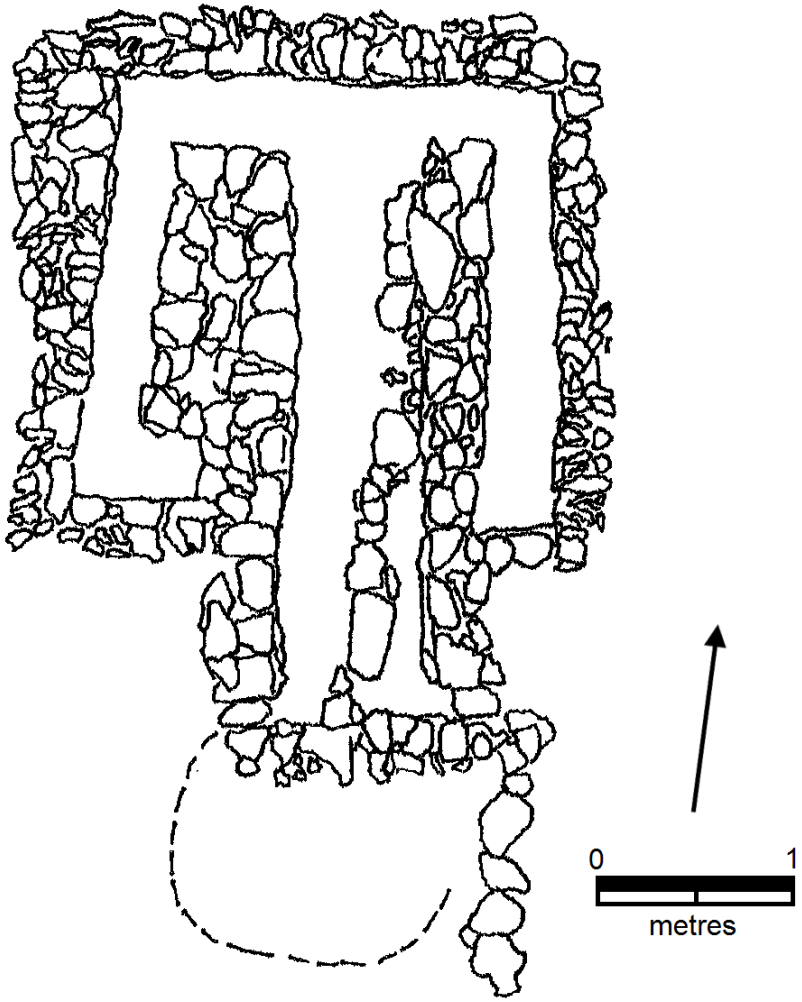


Figure 7.19 – Plan of oven at Orton Hall Farm – after Mackreth 1996 p.77, Fig.51.

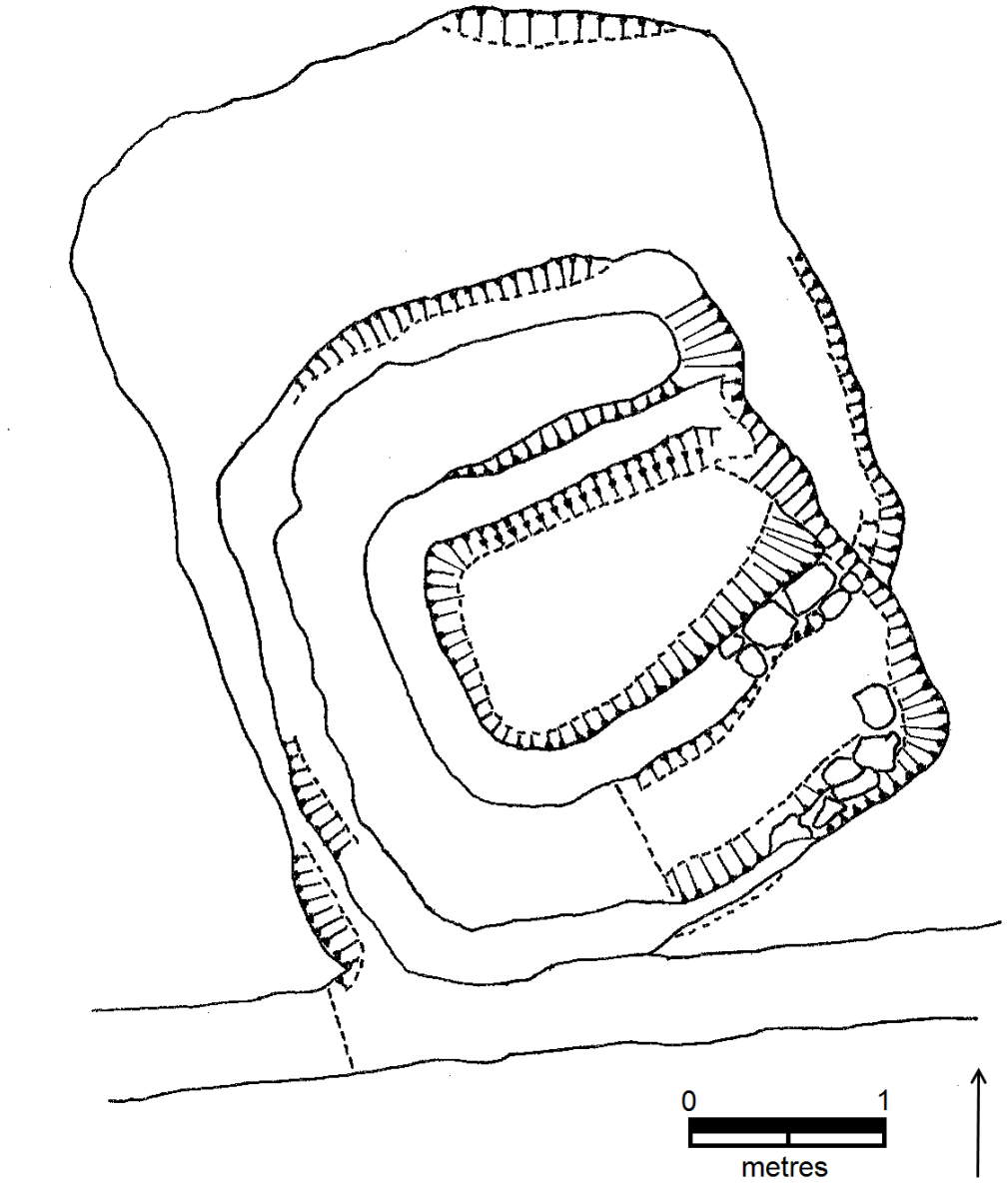


Figure 7.20 – Plan of drying building at Duxford – after Lyons 2011 p.84, fig.47.

It would be premature to assume that the distribution of these possible examples of 'Very Late Roman' continuity has any historical significance, since there is no immediate way of determining whether or not these few potential cases are indicative of a wider pattern. It is entirely plausible that many more ovens continued in use into the 5th-6th centuries but, without the fortuitous survival of contemporary pottery in their destruction layers or the availability of radiocarbon dates, the idea cannot be tested. These five cases could be as exceptional as they currently appear. The dating evidence likewise remains somewhat ambiguous: terminal usage dates could lie anywhere within the 5th and 6th centuries.

There are, however, some points of interest here. Firstly, just as there are hints of morphometric uniformity among the few monumental grain ovens of the Mid Saxon period, so too do similarities occur between the Romano-British T-shaped ovens and their variants: not only those four examples discussed above, but also others within the study regions (Figure 7.21). The trend should not be exaggerated, and it is certainly not argued here that there is any statistical significance to the observed metrical uniformity. It is tentatively suggested, however, that the morphometric similarities among the Romano-British ovens, and among the few Mid Saxon examples, raise the possibility of standardized commissions rather than *ad hoc* constructions, *i.e.* pre-designed ovens whose dimensions were determined by something other than strict logistical requirement. This is not to claim that the ovens were functionally unnecessary, or that they must have been larger than was functionally necessary. Rather, it is proposed that such ovens may represent *ideological* as much as economic investments: status symbols, perhaps, reflecting pretension in their inherent monumentality, their substantial processing capacity, and also the large amounts of firewood that they presumably required.

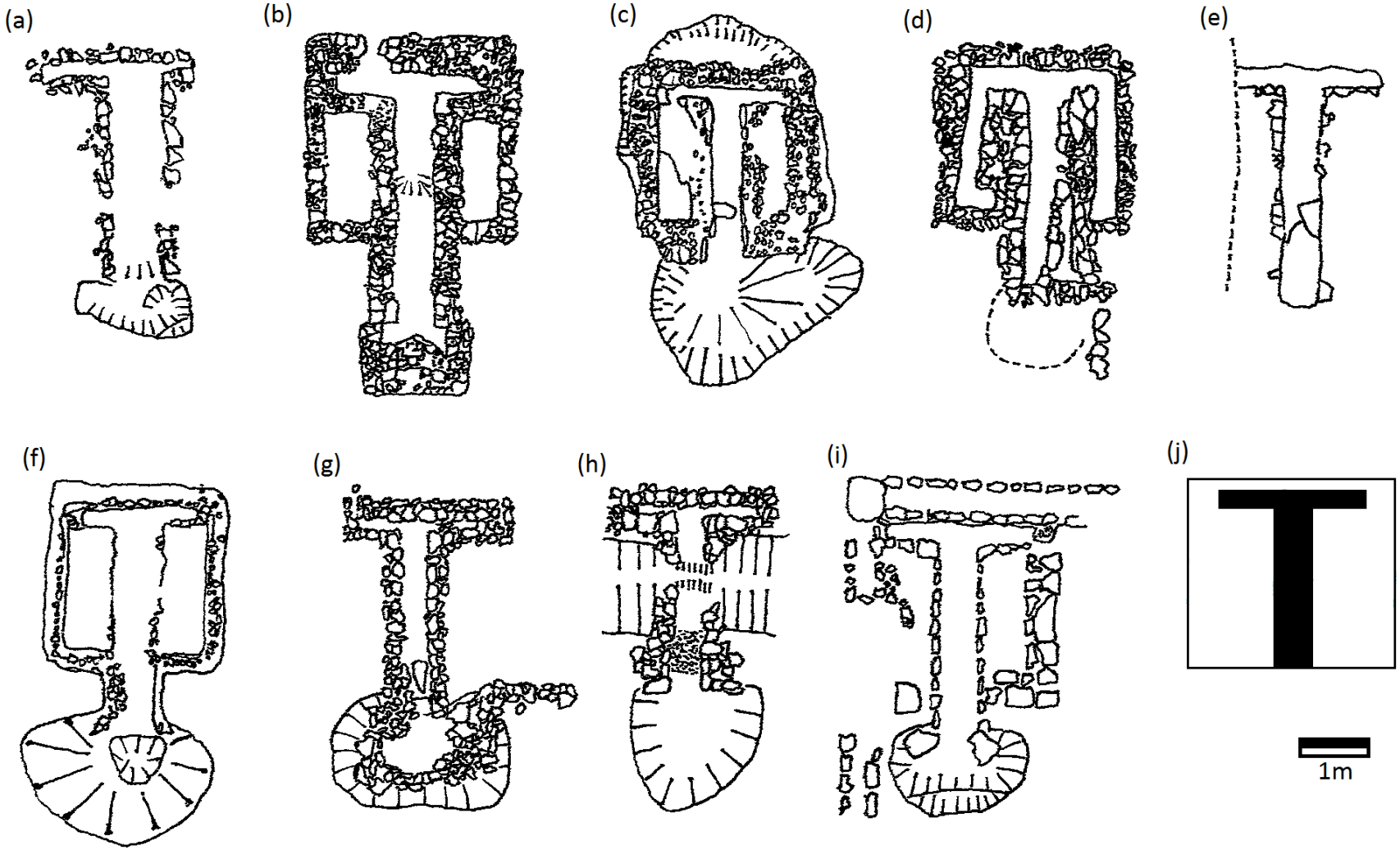


Figure 7.21 – Plans of Romano-British T-shaped ovens compared: (a) Alchester; (b) Goring; (c) High Post; (d) Orton Hall Farm; (e) Yarnton – after Hey *et al.* 2011 p.242, Fig.9.7; (f) Durrington – after Morris 1979 p.158, Fig.1; (g-h) Barton Court Farm – after Miles 1986, microfiche 3:G4-6, Fig.60-61; (i) Farmington – after Morris 1979 p.160, Fig.3; (j) conjectured common morphometric model.

This interpretation recalls Purcell's idea of 'landscapes of production' in the *villae rusticae* of classical antiquity, in which the productive elements of a rural estate (*e.g.* barns, oil presses) held aesthetic appeal, and celebrated the owner's status as manager of a productive agricultural environment.[472] While it cannot be assumed that cultural and economic concepts of estate management from classical antiquity are directly analogous to those of later Roman Britain and Mid Saxon England, the Mid Saxon period does at least offer a plausible historical context for the monumentalization of the productive landscape: namely, the consolidation and formalization of landholdings.[473]

The intended consumer(s) of the dried/malted grain might also be a significant factor in the construction of monumental grain ovens. Romano-British grain, if destined for consumption by garrisons or urban populations, might well have been processed and dispatched in relatively large batches, ready for transportation in bulk. Produce intended for local consumption, by contrast, could perhaps afford to be processed in a more piecemeal fashion, as and when required. Mid Saxon grain destined to be rendered in tax/tribute, or for consumption by the proto-urban populations of the *emporia*, might likewise have been processed in large batches for similar reasons; whereas piecemeal processing might again have been more appropriate for locally consumed cereals, and could more easily have been achieved without the use of monumental masonry ovens.

Hence, monumental grain ovens may serve as an index of social display in the productive landscape, and/or targeted production for non-agricultural consumers. One or both of these factors may have continued to be relevant, at least in some parts of the study regions, into the 5th century, *e.g.* if urban populations or villa infrastructures persisted locally; and to have assumed renewed relevance from the 7th/8th century onwards. Large-scale production *per se* is a plausible

[472] Purcell 1995 pp.157–173; Marzano 2007 pp.91–93.
[473] See above, §1.2.

but not a necessary inference to draw from the construction of monumental grain ovens: in the context of tribute/taxation, a multitude of small harvests could have been mobilised, resulting in large composite batches to be processed in monumental ovens.

7.3.3 Vernacular grain ovens

This model could help to explain the apparent discrepancy in the study regions between, on the one hand, the archaeobotanical and structural evidence for increasing levels of cereal production at some sites, and, on the other hand, the general lack of monumental grain ovens. The discrepancy is most striking at 8th-9th century Lyminge and Yarnton, where the possible grain ovens in the putative storage and processing zones are extremely modest in comparison with their large adjacent 'barns', with total lengths of just over 2m at Lyminge, just over 1m at Yarnton (Figure 7.22).[474] It should be noted that, as with the possible barns, the evidence for these features being grain ovens is largely circumstantial and the interpretation conjectural: signs of burning, concentrations of charred plant remains nearby, and approximately linear plans including, at Lyminge, a 'waisted' flue. Unlike the monumental oven at Higham Ferrers, which lies at some remove from the other structures, these smaller 'ovens' are situated well within their respective settlements: perhaps because their smaller size represented less of an immediate fire hazard, and perhaps also because they had no particular aesthetic value – whereas the Higham Ferrers oven, as argued above, may have served as a status symbol and therefore been situated for maximum visual impact upon those approaching the complex.

[474] See above, §7.2.3.

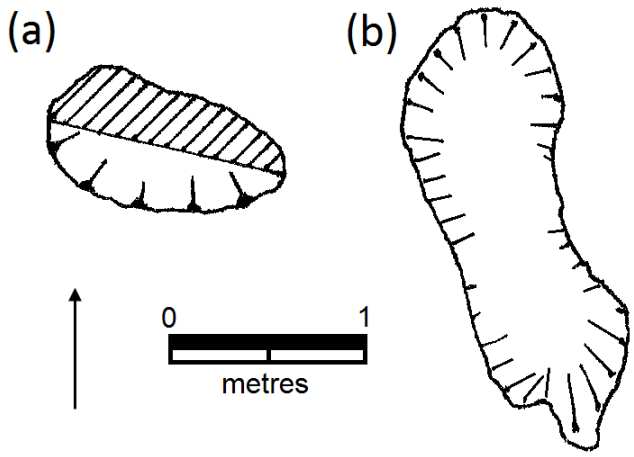


Figure 7.22 – Plans of possible ovens at (a) Yarnton – after Hey 2004 p.150, Fig. 7.10; (b) Lyminge – after *Lyminge Archaeological Project* Archive.

In the model proposed here, these smaller grain ovens would have been sufficient for the piecemeal processing of a large harvest in relatively small batches, as and when required for local consumption. Until required and processed, cereals could remain in their sheaves, the chaff affording extra protection during storage. Alternatively, it may have been considered a more efficient use of labour to spread out the tasks of crop processing over the wintertime, whereas immediate large-scale processing in bulk at harvest time would have required a more intensive input of labour (and fuel) over a shorter period.[475] Indeed, such a strategy of wintertime processing could be hinted at in the estate management tract known as the *Gerefa*, a literary work of *c.*AD 1100, which lists threshing (*ðerhsan*) and building 'a stove at the threshing-floor (*on odene cylne macian*) – for an oven (*ofn*) and kiln (*aste*)…' among the reeve's duties in winter.[476] The previous chapter has already raised the possibility of spring-sowing at Yarnton, another strategy which was perhaps intended to spread out agricultural tasks and so make more efficient use of limited labour.[477]

[475] This latter approach, one could conjecture, might have been more practicable on a Roman villa estate with a large body of servile labourers.
[476] Swanton 1975 p.26.
[477] See above, §6.7.2.

Several other features in the study regions could plausibly be interpreted within this category of small 'vernacular' grain ovens. They exhibit considerable heterogeneity in their plans, are usually clay-built, and are of uncertain longevity. Among the earliest is feature 7 at Little Oakley, a markedly waisted, rubble-lined oven, cautiously dated by sherds of carinated bowls to the early 5th century, in a phase which succeeded a Roman villa (ES2, Figure 7.23). Poor recording, however, precludes a secure understanding of this early post-Roman (or 'Very Late Roman') phase of activity. [478]

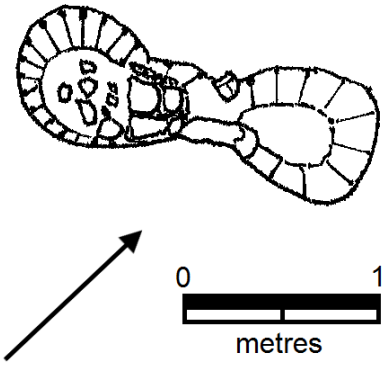


Figure 7.23 – Plan of possible oven at Little Oakley (heating chamber to the left, stoking area to the right) – after Barford 2002 p.45, Fig.37.

Insecure dating is symptomatic of other supposedly Early Saxon vernacular ovens in the study regions, such that there is no incontrovertible evidence to contradict our working hypothesis that grain ovens were not built between the 5th and 7th centuries. Feature 7 at the Criminology Site (CA19), an ovoid pit of 5th-7th century date containing charred plant remains, charcoal, and burnt stones, has similar dimensions to the Yarnton 'oven' and lies closely adjacent to a rectilinear posthole structure: a highly tenuous, circumstantial case for what would, in any case, be a very small grain oven (Figure 7.24).[479]

[478] Barford 2002 pp.45–46.
[479] Dodwell *et al.* 2004 p.115.

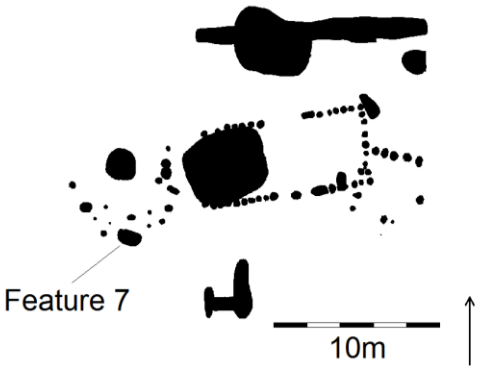


Figure 7.24 – Plan of features at Criminology Site – after Dodwell *et al.* 2004 p.111, Fig.25.

Three possible ovens at Brettenham, one keyhole-shaped and two sub-rectangular, are assigned to the site's 5th-6th century phase (NO20; Figure 7.25); and four or five subrectangular examples at Brandon Road North in Thetford were considered to be of 5th-6th century date, largely on stratigraphic grounds (NO17, Figure 7.26).[480] However, there are problems of residuality, intrusion, and ambiguous stratigraphy at these sites, and it would be possible to argue for a Late Roman date for these features. The same is true of the clay-lined feature 3405 at Handford Road, Ipswich, interpreted as an oven with a long, curving flue (SU13, Figure 7.27). It contained only a single sherd of handmade pottery and was originally thought to be of Roman date, but was later reassigned to the site's Early Saxon (5th-6th century) phase on stratigraphic grounds, since it cut Roman ditches and was situated *c.*5m from an Early Saxon post-built structure (hall 2976).[481] Even if we accept a 5th-6th century date for the Brettenham and Brandon Road ovens, the Handford Road structure would seem to be anomalously large for this period. The 5th-6th century date might therefore be doubted and a Roman date preferred – unless the central place functions attributed to Ipswich's 'urban precursor' in the 7th century had origins in the 5th-6th centuries, thus providing a more plausible (if remarkably early) context for large-scale processing in the Ipswich area.[482]

[480] Mudd 2002 pp.67–68; Atkins & Connor 2010 p.29.
[481] Boulter 2005 pp.26–27.
[482] Scull 2002 pp.311–315.

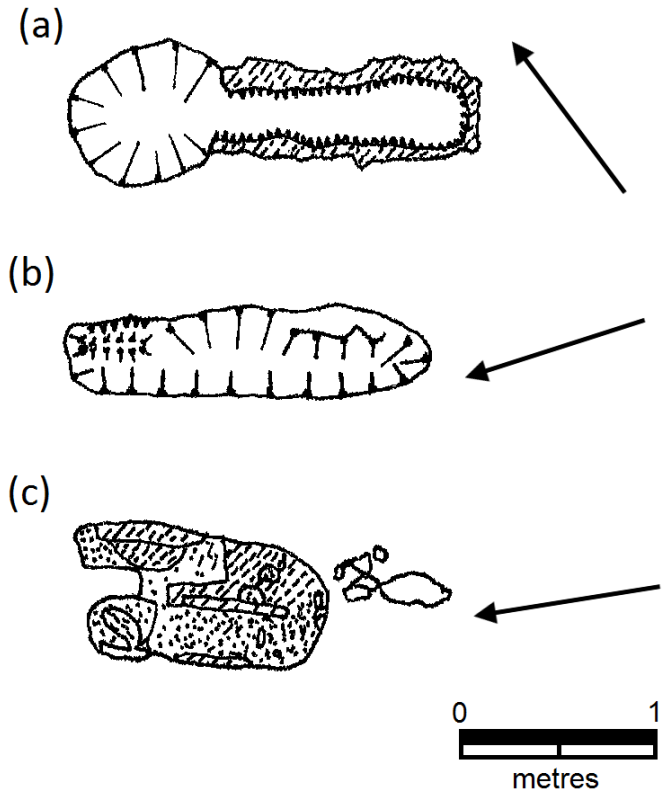


Figure 7.25 – Plan of ovens at Brettenham – after Mudd 2002 p.68, fig.47.

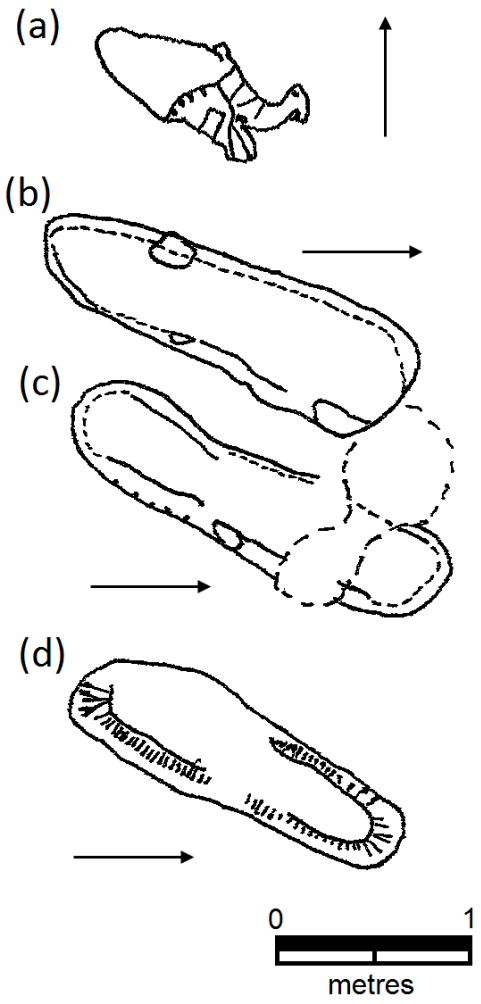


Figure 7.26 – Plan of ovens at Brandon Road North – after Atkins & Connor 2010 p.28, fig.12.

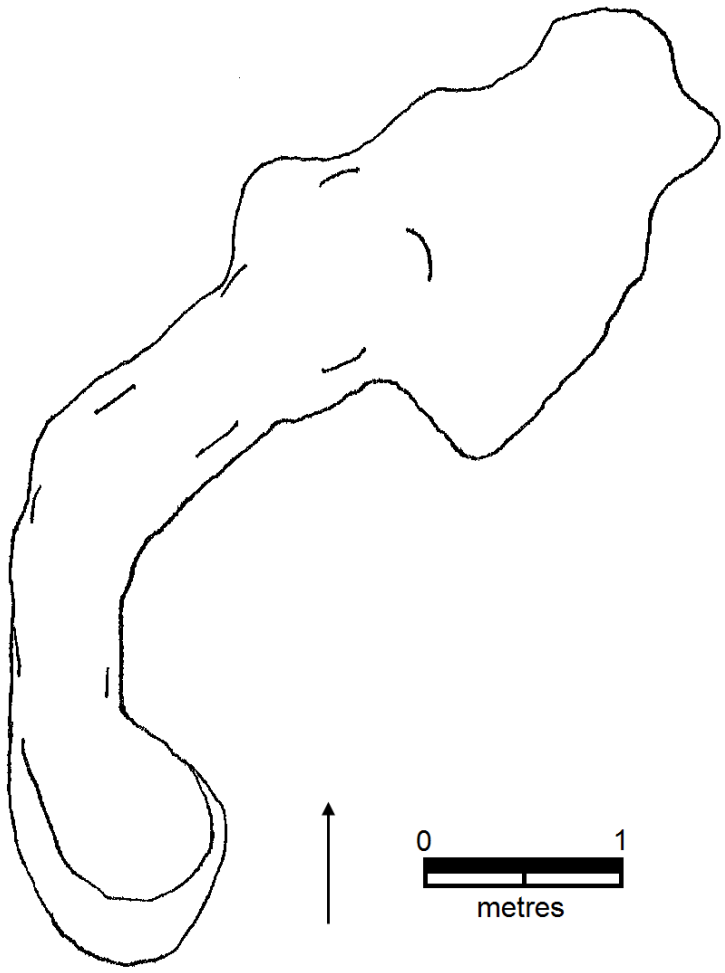


Figure 7.27 – Plan of oven at Handford Road (stoking area to north, heating chamber to south) – after Boulter 2005 p.23, fig.8

There are several better-dated ovens of 7th-9th century date, although it should be stressed that, unless otherwise stated, grain oven functions remain conjectural in each case. Some are of a similar size to the Yarnton hearth, just over 1m in length (Figure 7.28). The small oven/hearth at Great Wakering (ES9, hearth 215) is not closely datable in itself, but is associated with the putative Mid Saxon minster at this site; spelt glume bases were recorded as being common in its fill.[483] The sub-rectangular oven at Stansted Carpark (ES4, oven 106088) was the sole Mid Saxon feature discovered, despite extensive excavations. It contained a fill of fired clay and charcoal, the latter radiocarbon dated to cal.AD 680-890.[484] Structure 311 at Sedgeford belongs to the mid-/late-9th century phase, in which Ipswich and Thetford wares overlap, and appears to have been constructed of clay and stone; the overall morphology is unclear since the feature is truncated to both east and west.

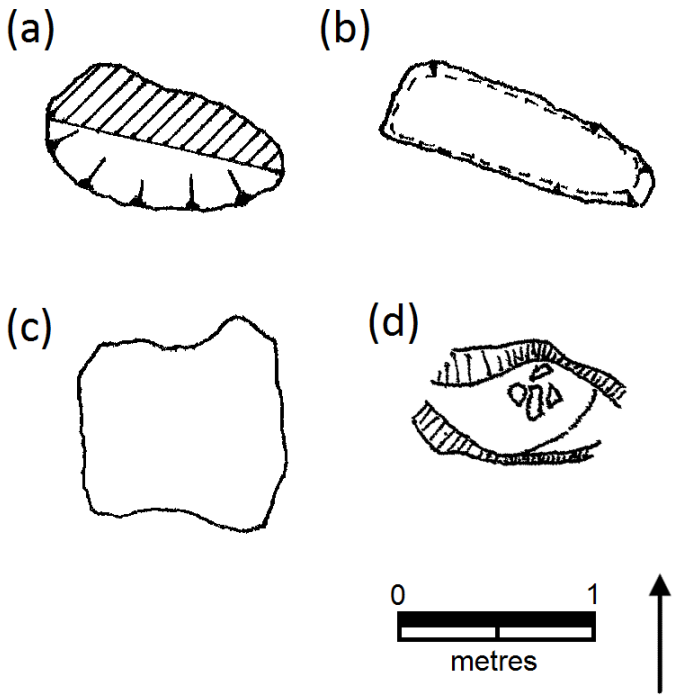


Figure 7.28 – Plans of possible ovens at (a) Yarnton – after Hey 2004 p.150, Fig. 7.10; (b) Great Wakering – after Dale *et al.* 2010 p.210, Fig.13; (c) Stansted Carpark – after Cooke *et al.* 2008 p.183, fig.9.3; (d) Sedgeford – after Davies 2008 p.91, Fig.35.

[483] Dale *et al.* 2010 pp.209–210, 219.
[484] Cooke *et al.* 2008 pp.183–184.

More similar in size to the Lyminge feature is the sub-rectangular Oven M20 at Chiefs Street, Ely (CA9, Figure 7.29), which belongs to a phase dated by Ipswich Ware to the 8th-9th centuries. Like the nearby West Fen Road sites, the features at Chiefs Street might well relate to the Mid Saxon minster at Ely.[485]

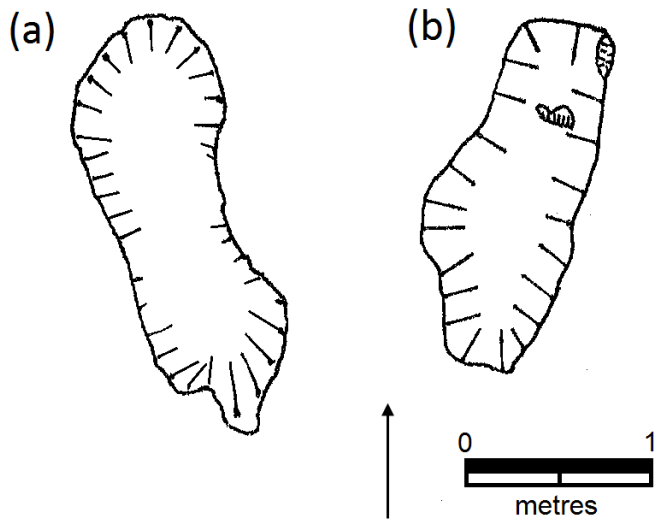


Figure 7.29 – Plan of possible ovens at (a) Lyminge - after *Lyminge Archaeological Project* Archive; (b) Chiefs St, Ely (scale approximate) – after Kenney 2002 p.14, Fig.4.

Finally, there is a set of appreciably larger ovens of similar date (Figure 7.30). Oven 646 at Brandon Road North (NO17) contained a sherd of Ipswich Ware and probably belongs to the site's 7th/8th-9th century phase; it also contained hammerscale and could therefore have served metalworking rather than grain processing functions, although the excavators do not exclude 'domestic' functions.[486] There was no evidence for the function of hearth 458, from the 7th-early 8th century phase at Eynsham Abbey (OX7), or for that of the 'dumb-bell' shaped clay oven of 8th-9th century date at Sedgeford (NO1).[487]

[485] Kenney 2002 pp.13–14.
[486] Atkins & Connor 2010 p.33.
[487] Hardy *et al.* 2003 p.42; Bates 1991 p.5.

The waisted Kiln 418 at Wolverton Turn – for which no excavation plan was available – appears to have been built of clay, possibly with some stone, and is assigned on stratigraphic grounds to the Mid Saxon phase of the enclosure complex (BU4).[488]

'Composite hearth' 394 at Great Wakering, apparently built of clay and belonging to the putative Mid Saxon monastic phase, was again of indeterminate function. Levels of iron slag in nearby deposits were deemed by the excavators to be insufficient to demonstrate local smelting, but the charred plant remains (including spelt glume bases) from the oven's fill could represent fuel rather than primary grain processing waste.[489]

Finally, Oven A at North Elmham Park is a clay hollow of presumed Mid Saxon date, preceding the bakehouse of the ecclesiastical complex. It does not survive in its entirety, but could represent the largest example discussed here (NO3).[490]

Although detailed descriptions and illustrations have yet to be published, it is also worth mentioning the hearths/kilns discovered by the waterfront at Brandon (SU5), which may have been used for drying flax crops.[491]

[488] Preston 2007 p.95.
[489] Dale *et al.* 2010 p.209.
[490] Wade-Martins 1980 pp.69–73.
[491] Murphy & Fryer 2009 p.13.

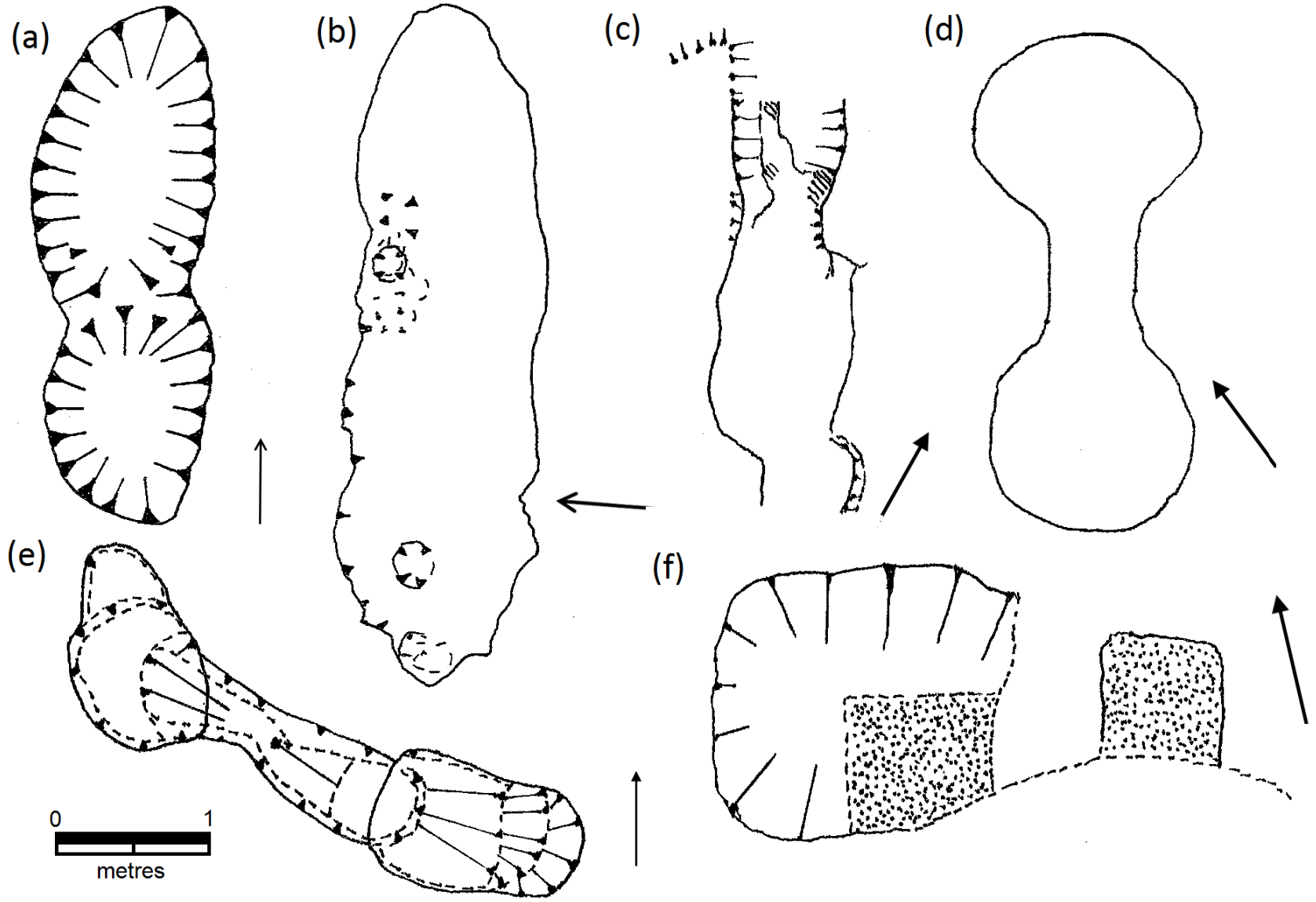


Figure 7.30 – Plans of ovens at (a) Brandon Road North – after Atkins & Connor 2010 p.32, Fig.14; (b) Eynsham – after Hardy *et al.* 2003 p.43, Fig.3.7; (c) Sedgeford – after Bates 1991, fig.5i; (d) Wolverton Turn – approximate reconstruction from description in Preston 2007 p.95; (e) Great Wakering – after Dale *et al.* 2010 p.209, Fig.12; (f) North Elmham Park – after Wade-Martins 1980 p.71, fig.87.

7.3.4 Discussion

It is likely that Anglo-Saxon grain ovens, of any type, are under-represented in the archaeological record, because of difficulties in both dating and discovering such features. As Hamerow suggests, they might often have been situated well away from settlement centres in order to reduce the risk of accidental conflagration (the relatively isolated ovens at Stansted and Feltham might perhaps illustrate this phenomenon).[492] If all of the above features are accepted as grain ovens, however, then a pattern begins to emerge. There is a marked distributional bias towards high-status and/or ecclesiastical sites of Mid Saxon date: Lyminge, Ely, Eynsham, Wolverton Turn, Great Wakering, Brandon and North Elmham Park; and, beyond the study regions, sites such as Higham Ferrers and Hoddom. The apparent consistency of the pattern is instructive, suggesting that high-status sites – lay or ecclesiastical – were centres of innovation and investment in crop processing in the Mid Saxon period. The construction at some such sites of monumental masonry grain ovens further suggests that there may have been an ideological dimension to this development. It is also interesting to observe that in early medieval Ireland, where the evidence for grain ovens is much more abundant than in Anglo-Saxon England, there appear to have been two peaks in construction: the first around the late 5th/early 6th century, the second in the 8th century and thus perhaps coinciding with the innovations in Mid Saxon England. The possibility of a connection between the two phenomena will be considered further in the final chapter.[493]

[492] Hamerow 2012 p.155.
[493] McCormick *et al.* 2011 pp.33–34; see below, §9.3.

7.4 Watermills

This section considers the hypothesis that, like specialist storage facilities and large grain ovens, watermills were an innovation of the Mid Saxon period, related to the large-scale and/or centralized production and processing of cereals. Sites mentioned in the discussion are mapped in Figure 7.31. Remains of watermills are exceptionally rare in the study regions. A channel to the south of the settlement at Wicken Bonhunt (ES1), presumably belonging to the 8th-9th century phase of the site, has been speculatively interpreted as a leat for a watermill. This suggestion is apparently made on purely circumstantial grounds since there are no associated structural remains (Figure 7.32).[494]

More securely identified are the remains of a triple vertical watermill and leat at Old Windsor (BE9) discovered in Hope-Taylor's excavations in the 1950's. The excavations remain unpublished except for brief summaries and the site archives are not readily accessible at the time of writing.[495] Dendrochronology has subsequently supplied a probable construction date in the late 7th century for the Old Windsor complex, making it broadly contemporary with late 7th/early 8th century watermills identified at Barking (Greater London), Northfleet (Kent), Worgret (Dorset) and Wellington (Herefs.).[496] These sites represent the earliest known archaeological evidence for Anglo-Saxon watermills, which thus appear to be an innovation of the later 7th century. The national sample is so small and dispersed that we cannot assume that it is necessarily representative of a general trend, but it is interesting to observe a near-contemporary trend towards the increasing use of watermills in early medieval Ireland, in the 7th and especially 8th centuries, perhaps beginning at ecclesiastical centres.[497]

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[494] Wade 1980 p.96.
[495] Wilson & Hurst 1958 p.184; Maureen Mellor and Brian Durham pers. comm. 2013.
[496] Fletcher & Tapper 1984 pp.119–120; Denison 2001; Blair 2005 p.256; Tyers in Andrews, Biddulph, Hardy & Brown 2011 pp.92–3.
[497] McCormick *et al.* 2011 pp.39–40. See below, §9.3.

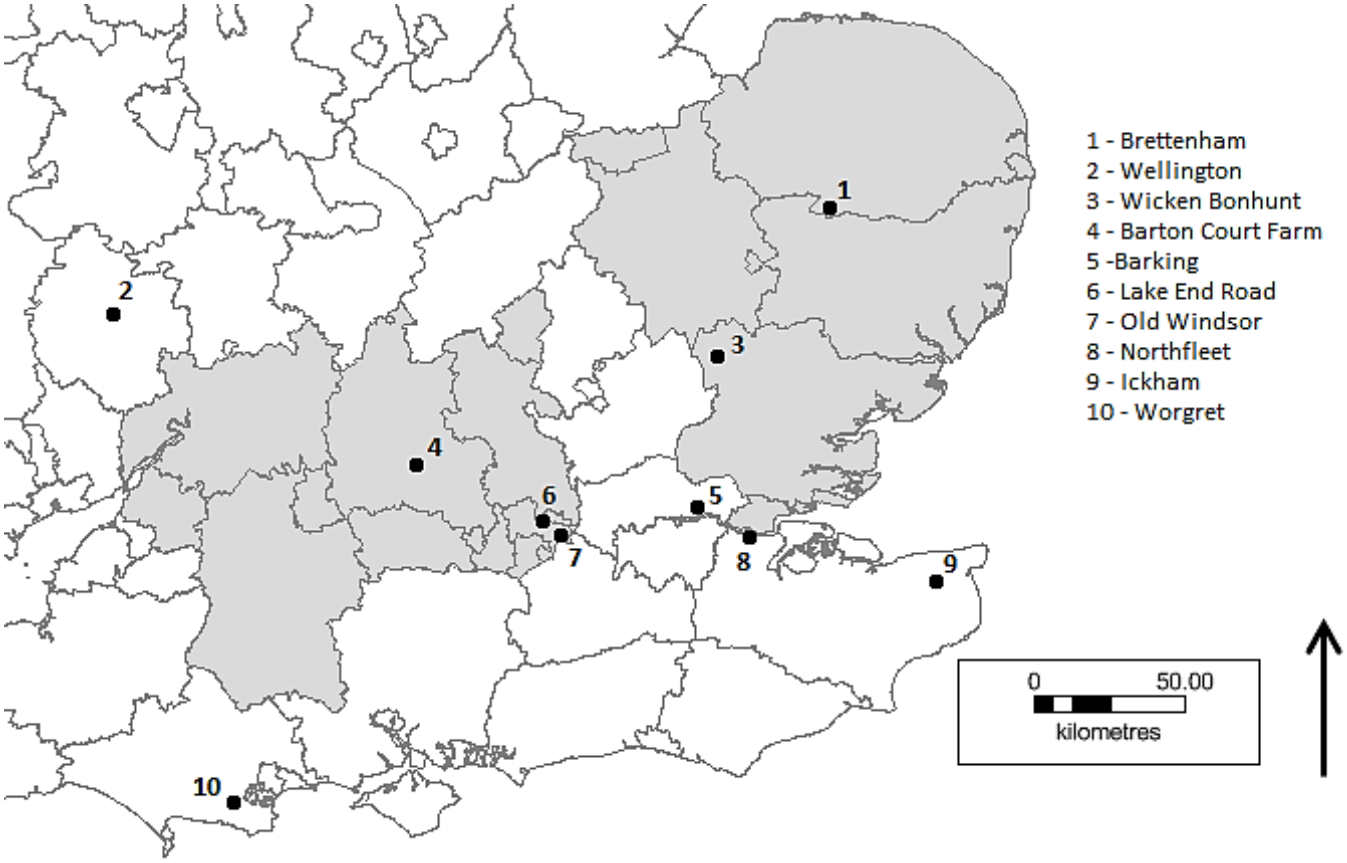


Figure 7.31 – Map of sites mentioned in discussion of watermills (Digital Mapping Data © Collins Bartholomew 1995).

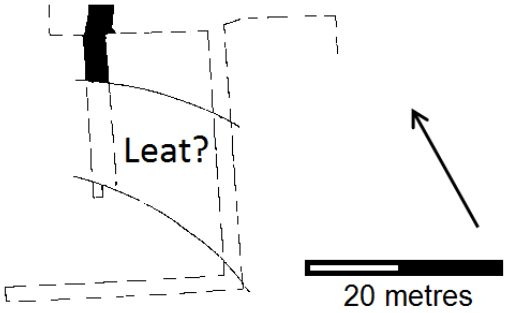


Figure 7.32 – Conjectured mill leat at Wicken Bonhunt – after Wade 1980 pp.97, Fig.38.

The scarcity of archaeological remains of watermills applies also to the Late Saxon period, despite the thousands of examples recorded in the Domesday survey of 1086.[498] Indeed, distribution maps of the Domesday evidence suggest that mills proliferated in the study regions by the 11th century (Figures 7.33–7.34).[499] Given that these data concern the vills at which mills were recorded, rather than the individual mills themselves, the actual abundance of structures will have been even greater than these distribution maps suggest, since some vills contained several mills – presumably watermills, although some might conceivably have been animal-driven.

Preservation conditions could potentially exercise a strong bias against the survival of watermill remains which, as watercourses change over time, are likely to become vulnerable to riverine erosion, especially perhaps those smaller than the elaborate complex at Old Windsor.[500] Even where structural remains survive, dating can still be problematic. Dendrochronology may be able to date constructions and repairs, but chronologies of abandonment are far harder to ascertain. At the Romano-British milling complex at Ickham (Kent), for example, there are signs of continued occupation into at least the early 5th century, but while a 'post-Roman phase of water

[498] Watts 2002 p.83.
[499] Maps constructed with reference to the Domesday Dataset, University of Hull <https://hydra.hull.ac.uk/resources/hull:domesdayDisplaySet>, and utilizing PASE Domesday GIS data <http://domesday.pase.ac.uk>, both accessed June 2013.
[500] Watts 2002 pp.17–18; Wilson 2007.

management and a mill beyond the site limits' is mooted, the possibility remains entirely hypothetical.[501]

It is interesting to note that the vast majority of Romano-British watermills are recognized not from any structural remains, but from the morphometry of millstones, *i.e.* the differentiation of those suggestive of mechanized milling (water- or animal-powered) from hand-querns. These millstones include some very late or post-Roman examples, such as a fragment from the south-east paddock at Barton Court Farm of supposed early 5th century date (OX22) and another in a supposed 5th-6th century context at Brettenham (NO20).[502] Fragments of a 'small millstone' also occur in a probable 8th-9th century context at Lake End Road (BU22),[503] but there do not appear to be any consistent, published criteria by which querns and millstones should be differentiated. A systematic study of Anglo-Saxon quern and millstone morphometry, comparable to the work of Spain and Wilson on Romano-British material, is beyond the scope of this project, but could potentially shed further light on the development of milling technology in this period.[504]

[501] Bennett *et al.* 2010 pp.70–1, 326.
[502] Wilson in Bennett *et al.* 2010 pp.63–4; Spain in Miles 1986, 5:A13 (microfiche); Roe in Mudd 2002 pp.76–7.
[503] Roe in Foreman *et al.* 2002 p.37.
[504] See Coulter 2011 pp.183–4 for some advances in this direction.

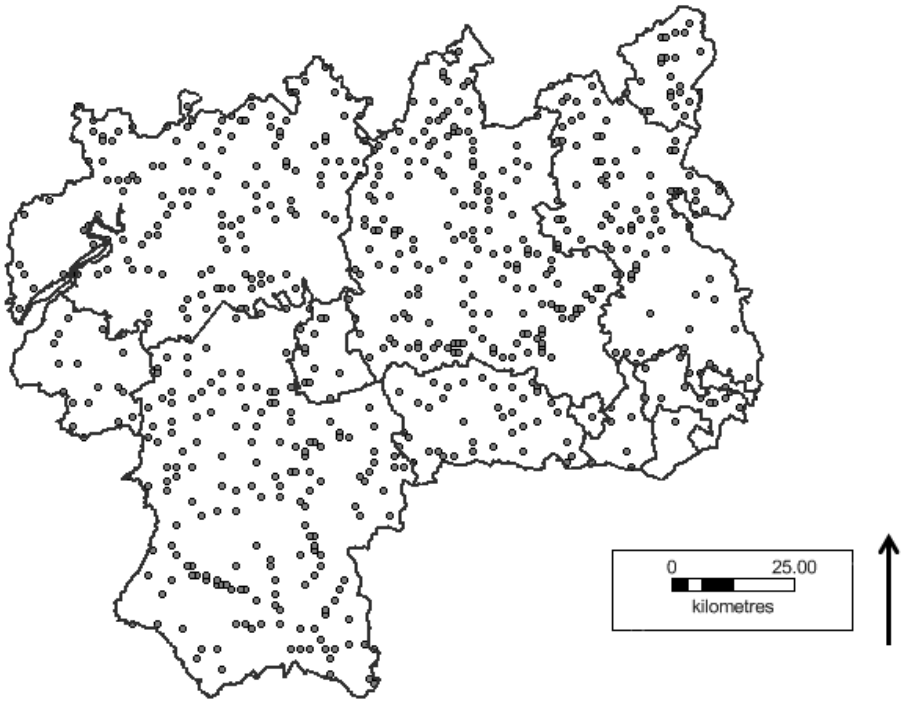


Figure 7.33 – Mapped distribution of vills with mills in Region 1, as recorded in the Domesday survey (Digital Mapping Data © Collins Bartholomew 1995; PASE Domesday GIS © The Prosopography of Anglo-Saxon England Database Project 2010).

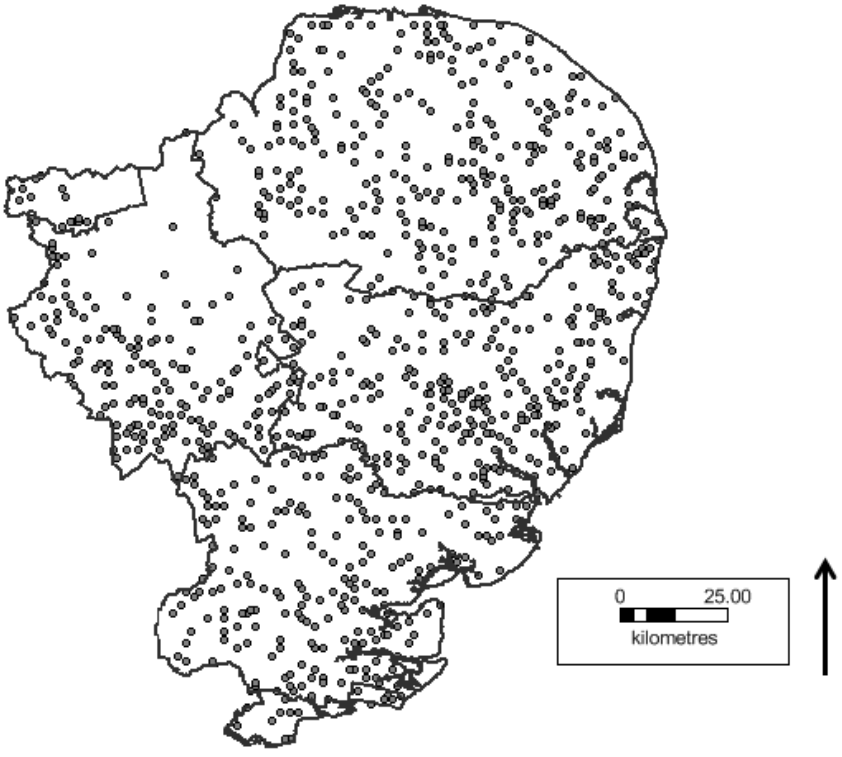


Figure 7.34 – Mapped distribution of vills with mills in Region 2, as recorded in the Domesday survey (Digital Mapping Data © Collins Bartholomew 1995; PASE Domesday GIS © The Prosopography of Anglo-Saxon England Database Project 2010).

As it currently stands, the available evidence for mills would seem to support a similar model to that proposed above for monumental grain ovens: that they were absent in the Early Saxon period and rare in the Mid Saxon period, occurring only where they could serve (i) as status symbols, monumental claims upon the productive landscape, and (ii) to process large batches of grain in a relatively short period of time, as opposed to piecemeal processing by hand with querns.[505] As with monumental grain ovens, therefore, the construction of watermills presupposes – but is not a necessary corollary of – the large-scale and/or centralized production and processing of arable produce.

[505] *Cf.* above, §7.3.2.

7.5 Conclusions

One recurrent theme in this chapter has been the likelihood of *under-representation* in the archaeological record, due to complications in dating and identifying the relevant technologies. Storage facilities are not always easily recognizable as such. Grain ovens, especially those here termed 'vernacular', can be impossible to distinguish conclusively from other oven-like features, and few have been directly dated. Watermills, although distinctive once discovered, are particularly vulnerable to erosion or successive replacement, and the resultant dataset is correspondingly meagre.

Nonetheless, a consistent picture has begun to emerge. All of the specialist storage and processing technologies discussed in this chapter can be seen, with few if any exceptions, as Mid Saxon innovations. While some granaries, ovens and perhaps even watermills might have persisted in use beyond the early 5th century, *i.e.* in a 'Very Late Roman' phase, new constructions appear on current evidence to be a phenomenon of the 7th century or later. Moreover, they appear in general to show a distributional bias towards high-status and ecclesiastical sites. Overall, therefore, the evidence discussed in this chapter would support a model consistent with that proposed for the interpretation of charred plant remains: an increase in the scale and/or centralization of crop processing from the 7th and especially 8th centuries onwards, with a focus upon both lay and ecclesiastical estate centres.[506] In addition, it has been argued that these developments may have had an ideological dimension, in which agricultural productivity was invested with socio-cultural status.

[506] *Cf.* above, §6.8.

7.6 Prospect

The charred plant remains and the complementary structural evidence for crop processing and storage have now been examined in detail. It remains only to complete the investigation of Early/Mid Saxon crop husbandry through the analysis of plant remains preserved by other means: waterlogging, mineralization and ceramic impression. In this way, the spectrum of known taxa may be extended, and aspects of crop husbandry which are relatively poorly served by charred and structural evidence – primarily the processing of flax – may be addressed.

8 Waterlogged & Other Plant Remains

8.1 Introduction

This chapter analyses the data from plant macrofossils preserved by waterlogging, mineralization, and ceramic impression. Although these data are less abundant within the project dataset than those from charred plant remains (Table 8.1), they are nonetheless useful for two main reasons. Firstly, because waterlogging, mineralization and ceramic impression introduce biases different from those incurred through charring, these data can independently complement and supplement the taxonomic range of the charred dataset, elucidating in particular those crop taxa and plant parts that are unlikely to be preserved through charring.

Secondly, and by extension, these additional archaeobotanical sources may reveal environments and economic activities whose products and by-products are unlikely to become regularly charred. For example, by-products of flax retting (soaking) are more likely to be preserved by waterlogging, while mineralized remains from cess accumulations may shed light directly upon those plants exploited for food/fodder.

Table 8.1 – Representation of modes of preservation in the archaeobotanical dataset.

		samples	assemblages
principal means of preservation	charring	736	111
	waterlogging	40	13
	mineralization	3	4
	ceramic impression	n/a	4
dual means of preservation	charring/mineralization	6	3
	charring/waterlogging	1	2

8.2 Waterlogged plant macrofossils

Waterlogged plant remains survive where material has been saturated, more or less constantly, since antiquity, escaping microbial decay in anaerobic conditions. They can pose acute problems of interpretation, since the catchment zones of open watery deposits may potentially have been very wide, incorporating: (i) autochthonous aquatic or semi-aquatic species growing upon or immediately adjacent to the water; (ii) local ruderal taxa, accidentally deposited by natural means, *e.g.* by wind, birds, animal or accidental human action; (iii) crops, arable weeds, and other plants deliberately gathered to a settlement, and redeposited accidentally in the water; (iv) anthropogenic plant waste deliberately dumped in the feature, *e.g.* from cereal processing; and (v) direct remains of water-based activities such as flax-retting.[507]

Given the potential complexity of these deposits, this section does not seek to interpret each waterlogged sample comprehensively. Rather, it uses the waterlogged data to address two key issues:

i. the representation of potential crop taxa (and other usable plants);
ii. the representation of agricultural processing activities, specifically those relating to flax as a fibre crop.

8.2.1 Assessment of the waterlogged dataset

Waterlogged archaeobotanical data have been recorded from 15 of the sites listed in the gazetteer. In addition, supplementary 'off-site' data have been noted from palaeochannels at Sandon and Stansted, to which reference is made later in this chapter (all relevant sites are located in Figure 8.1). Separate data for individual samples are available for all of the 15 sites except Burghfield, whose assemblage – incorporating nine undifferentiated samples – consists of

[507] Green 1982 p.42.

both charred and waterlogged macrofossils, neither of which are quantified in the published report.

In the 40 samples for which quantified data are available, the total abundance of waterlogged macrofossils ranges from five to 1,238 items per sample (Table 8.2). In addition to waterlogged macrofossils, 239 charred items occur in <SMB2>, which derives from a Mid Saxon pit at Brandon whose lower fills are dominated by waterlogged plant remains but whose upper fills are dominated by charred remains. It is provisionally interpreted here as a sump or watering hole whose backfill includes a dump of charred plant waste.

The majority of waterlogged samples derive from wells, sumps, watering holes and other pits sunk below the water table; in addition, the St Aldate's samples represent sediments associated with palaeochannels and a river crossing, while four of the Brandon samples represent organic deposits from the peaty waterfront zone of that site.[508] Some samples represent different levels from the same wells, although they cannot necessarily be considered interdependent since in many cases they clearly represent discrete layers:

- <BCF3> and <BCF4> from Well 1083 at Barton Court Farm;
- <NEP1> to <NEP8> from Well II at North Elmham Park;
- <SHF1> to <SHF4> from Well 2957 at Slough House Farm;
- <SHF5> to <SHF8> from Well 130 at Slough House Farm;
- <WS1> and <WS2> separated by a wattle hurdle in Well A at Westbury-by-Shenley.

[508] Robinson in Dodd 2003 pp.365–372, 378–383; Murphy & Fryer 2009 p.9.

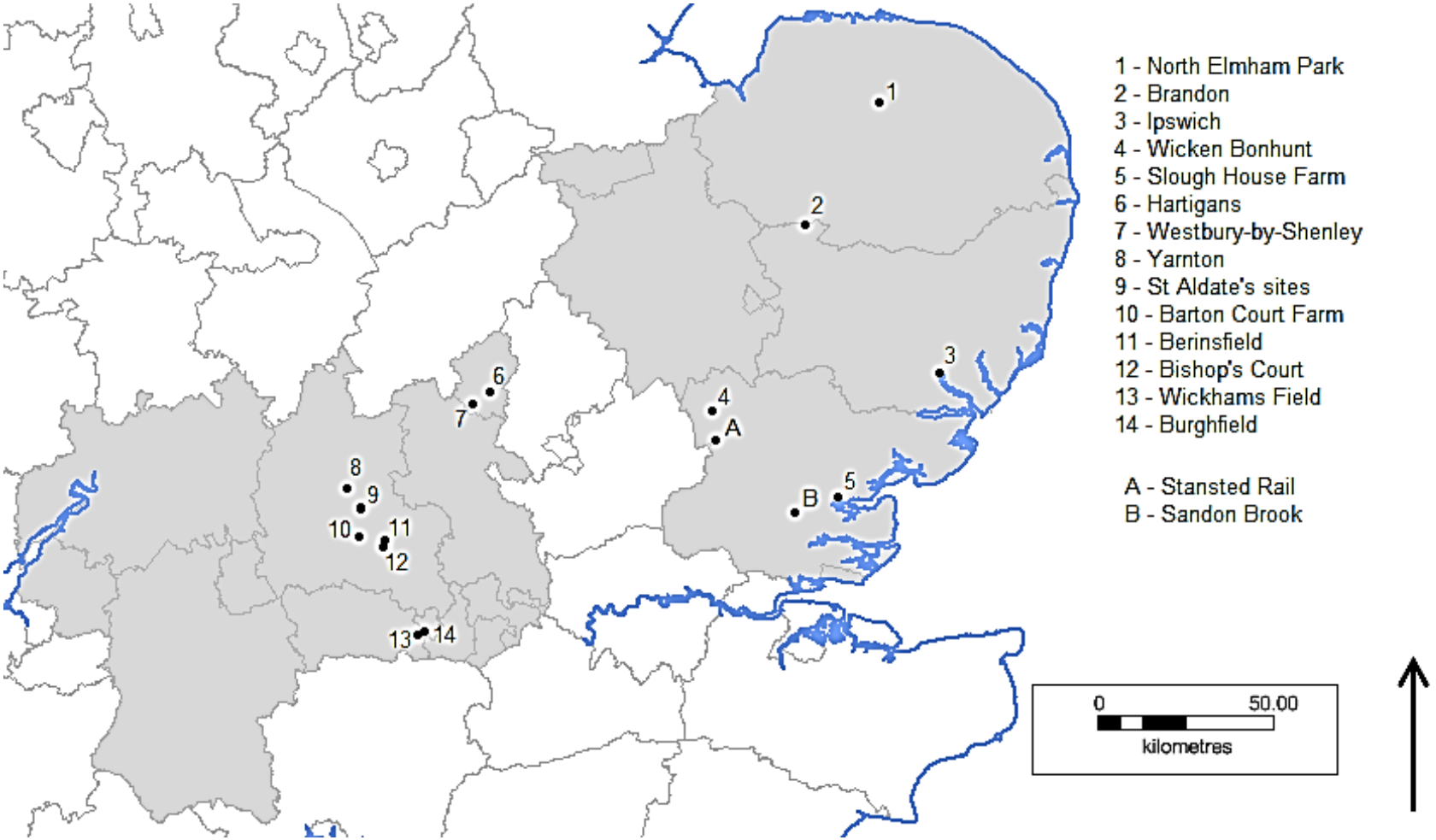


Figure 8.1 – Map of sites with waterlogged plant remains mentioned in text (Digital Mapping Data © Collins Bartholomew 1995).

Table 8.2 – Waterlogged samples in the project dataset ('x' denotes presence of data not fully quantified).

sample code	site (+gazetteer no.)	feature	chronology	abundance (+charred)	volume (g)
<BCF3>	Barton Court Farm (OX22)	well	Early	1,059	1,130
<BCF4>				468	1,130
<BSH1>	Bishop's Court (OX26)	well	Early	x	-
<BTT1>	St Aldate's – BT Tunnel (OX12)	layer	Intermediate	83	150
<BTT2>				303	150
<TMS1>	St Aldate's 89-91 (OX13)	gully	Mid	84	500
<H1>	Hartigans (BU6)	well	Early	415	-
<MFB1>	Berinsfield (OX25)	well	Generic	127 (+1)	1,130
<MFB2>				136	1,130
<WF2>	Wickhams Field (BE5)	well	Mid	496	-
<WF3>				130	-
<WS1>	Westbury-by-Shenley (BU8)	sump	Intermediate	521	1,000
<WS2>				1,238	500
<WS3>				527 (+1)	1000
<WS4>				676	500
<Y50>	Yarnton (OX10)	well	Mid	602	-
<Y51>				343	-
<IPS40>	Ipswich (Turret Lane) (SU14)	pit/well	Mid	98	-
<IPS41>	Ipswich (Lower Brook St.) (SU14)	pit		552	-
<NEP1>	North Elmham Park (NO3)	well	Mid	1,213	-
<NEP2>				172	-
<NEP3>				292	-
<NEP4>				28	-
<NEP5>				67	-
<NEP6>				403	-
<NEP7>				41	-
<NEP8>				5	-
<SHF1>	Slough House Farm (ES7)	well	Intermediate	57	500
<SHF2>				103	500
<SHF3>				100	1,000
<SHF4>				94	1,000
<SHF5>				311	250
<SHF6>				808	250
<SHF7>				309	1,000
<SHF8>				454	500
<SMB2>	Brandon (SU5)	pit	Mid	608 (+239)	-
<SMB19>		organic deposits on waterfront peat surface		223	3,000
<SMB20>				382	1,000
<SMB21>				49	200
<SMB22>				281	1,000
<WKB3>	Wicken Bonhunt (ES1)	well	Mid	170	-

Seven archaeobotanists are responsible for the analysis of the waterlogged macrofossils (Table 8.3). Two workers in particular, P. Murphy and M. Robinson, are responsible for more than half of all waterlogged assemblages and samples. The overall impact of inter-worker variability is therefore likely to be minimal.

Table 8.3 – Representation of archaeobotanists in the waterlogged dataset.

analyst	no. assemblages	no. samples
M. Robinson	6	10
P. Murphy	3	15
J. Letts	2	5
H. Jarman	1	8
R. Scaife	1	2
A.K.G. Jones	1	1
W.J. Carruthers	1	-

8.2.2 Potential crop taxa (and other usable plants)

The results of a basic presence analysis are shown in Figure 8.2, considering the occurrence of cultivated or otherwise potentially useful taxa among the 41 waterlogged samples. The selection of useful taxa is admittedly rather subjective, since many other wild species could in theory have been exploited. This list, however, has been compiled primarily for comparison with the charred taxa discussed above.[509]

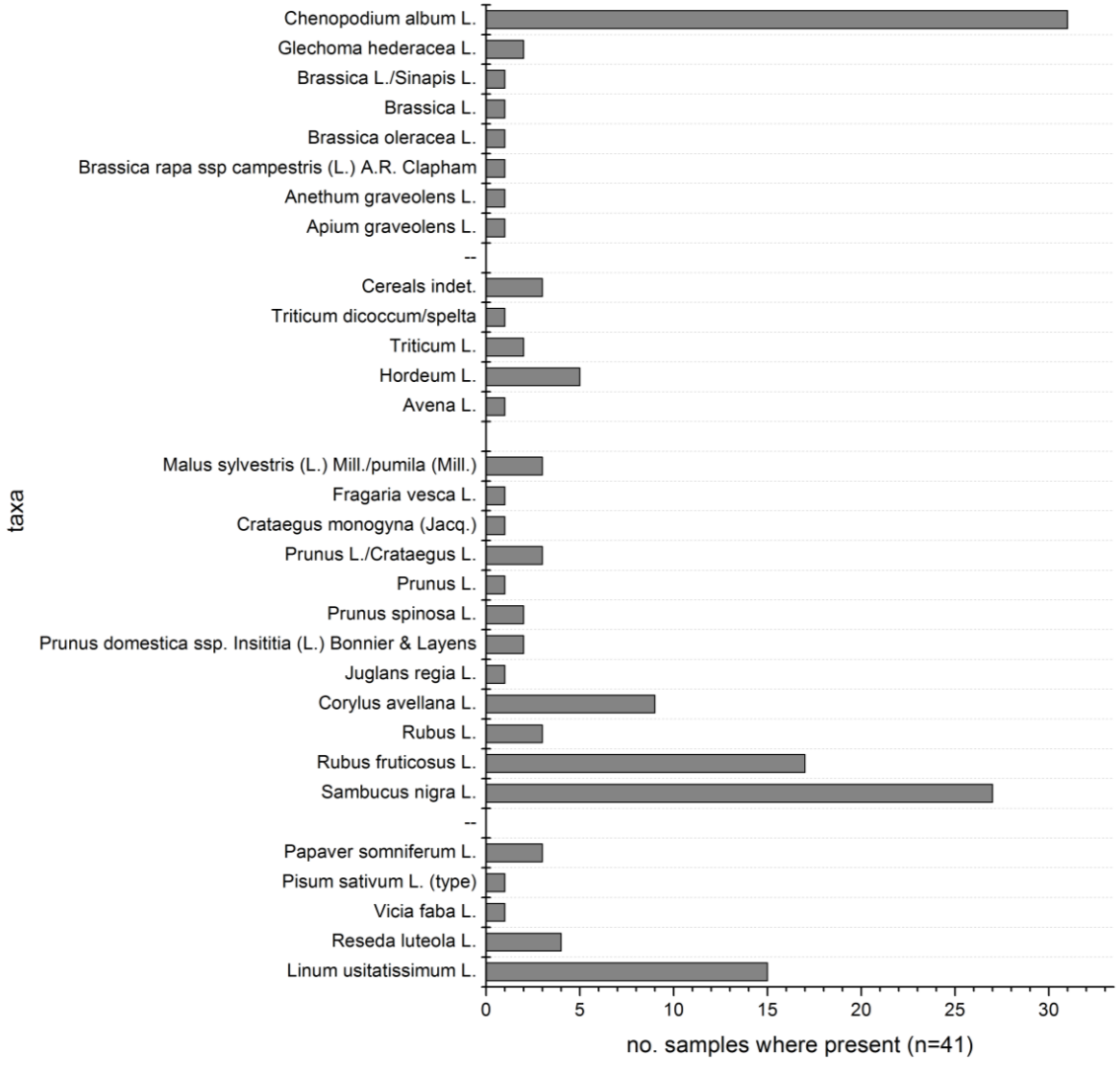


Figure 8.2 – Presence of potentially useful taxa among waterlogged plant macrofossils.

[509] See above, §6.3.

The wild herbaceous taxa, at the top of the diagram, occur in just one or two samples each, apart from the near-ubiquitous fat hen (*Chenopodium album* L.). It is highly plausible that this latter species is present as a ruderal from nearby disturbed or waste ground rather than as a food plant, hence perhaps its frequent co-occurrence with stinging nettle (*Urtica dioica* L., which occurs in 36 waterlogged samples), since both can be characteristic of disturbed and nitrogen-rich environments such as may be found within settlements.[510]

Of the remaining taxa in this group, four are notable for occurring *only* as waterlogged macrofossils in the project dataset, never charred or mineralized, although again their culinary use – let alone cultivation – cannot be securely demonstrated: wild celery (*cf. Apium graveolens* L.) and dill (*Anethum graveolens* L.) both occur in <IPS41>, wild cabbage (*Brassica oleracea* L.) in <WF2>, and ground ivy (*Glechoma hederacea* L.) in <BCF4> and <Y51>. The latter is also known as 'alehoof' and is usable in brewing in place of hops.[511] None of these examples can necessarily be considered 'crops' as such, and all are extremely rare in the dataset. However, it may be significant that a relatively exotic culinary taxon, the non-native dill, is identified only at Ipswich, reinforcing a nascent impression that Ipswich may have been in receipt of a more varied range of taxa than some other settlements (*cf.* the occurrence of charred hemp and hop seeds at Ipswich, albeit in small quantities).[512]

Cereal taxa are rare among the waterlogged remains (each taxon in ≤5 samples). However, the waterlogged material does shed a little further light on the contentious issue of Anglo-Saxon glume wheat cultivation.[513] Three waterlogged glume bases of probable emmer occur in <MFB1>, derived from a well at Berinsfield which cannot be closely dated within the 5th-8th century

[510] Robinson in Dodd 2003 pp.370, 382–3; Stace 2010 pp.285, 486.
[511] Hagen 2006 pp.207, 458.
[512] See above, §6.3.4.
[513] See above, §6.6.1.

period.[514] Although beyond the main remit of this study, there are also two palaeochannels in Essex (located above in Figure 8.1) which have produced glume wheat remains of possible Anglo-Saxon date: firstly in the sediments of the Sandon Brook, spanning the late Roman to late Saxon periods but not closely dated in between; and secondly in a palaeochannel sediment at the Stansted Rail site, preceding an organic band radiocarbon dated to cal.AD 530-680, and therefore of possible Early Saxon date. In both cases, most of the macrofossils in question are charred spelt glume bases deposited amongst waterlogged material. Although the macrofossils are not abundant, the fact that spelt is present in the form of charred glume bases suggests that it may have been processed nearby, and hence is arguably more likely to have been a cultivated crop than a volunteer or contaminant.[515] The inexact dating of these samples must, however, be emphasized: the spelt glume bases themselves have not been directly dated.

Among fruit-bearing woody perennials, few are present in more than three samples each, and most are already familiar from the charred dataset. Two species, however, occur only in the waterlogged dataset, and represent further additions to the relatively diverse culinary flora at Mid Saxon Ipswich and Brandon: strawberry (*Fragaria vesca* L., 27 seeds in <IPS41>) and walnut (*Juglans regia* L., as small, uncounted endocarp fragments in <SMB20>). As Murphy notes, however, walnuts may have been imported rather than grown locally: Brandon was evidently a high-status site which could well have been in receipt of luxury imports, and the Old English prefix '*wal-*' implies foreign connotations.[516]

Fruiting brambles (*Rubus fruticosus* L. agg.) and elder (*Sambucus nigra* L.) are more common occurrences in the waterlogged dataset. Waterlogged seeds of elder occasionally occur in large quantities: a cache of 278 in <NEP3> and 130 in <SMB2>. While elder could alternatively

[514] A stake from its wattle lining was radiocarbon dated to cal.AD 430-770 (at 95% confidence): Lambrick 2010 p.14, Table 1.
[515] Sandon Brook: Murphy 1987 p.13; Murphy 1994 p.26. Stansted Rail: Wiltshire and Murphy in Havis & Brooks 2004 pp.68–78, 350–354.
[516] Murphy & Fryer 2009 p.14.

be interpreted as an indicator of enriched waste ground nearby, the active exploitation of this species is sometimes suggested by the circumstances of its deposition. Firstly, the unusually high concentrations of elder seeds at North Elmham Park and Brandon arguably tell against casual, natural accumulation of seeds in these deposits, since the drupes (fruits) of *Sambucus nigra* contain no more than five seeds each.[517] Secondly, the moderate frequency of elder seeds in the mineralized (presumed cess) deposits discussed below implies that elderberries contributed to the Mid Saxon diet at Ipswich and Whitehouse Road.[518] Thirdly, 12 seeds of elder occur alongside 27 seeds of weld (*Reseda luteola* L.) in sample <SMB20> from the waterfront at Brandon – a zone which other evidence suggests was the site of flax processing for fibre production, as discussed below.[519] Weld occurs only in the four waterlogged samples from the waterfront at Brandon (<SMB19> to <SMB22>). Since both weld and elder can be used to produce dyes, it has plausibly been suggested that the waterfront samples from Brandon represent not only textile production but also associated dying activities.[520]

The occurrence of opium poppy (*Papaver somniferum* L.) in three waterlogged samples is notable: one seed in each of <SMB20> and <SMB22>, and a further five in <SMB21>, all from Brandon's waterfront. These occurrences supplement the sparse records of this possible crop in the charred dataset, and contribute further to the relative diversity of edible/usable taxa represented at Brandon. As with the charred material, however, there is nothing in the depositional circumstances of the waterlogged poppy seeds which necessarily demonstrates that the species was growing as a crop rather than a weed at Brandon.

Finally, flax (*Linum usitatissimum* L.) is relatively common among the waterlogged samples, several of which appear to represent distinct stages in the processing sequence of flax fibre crops.

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[517] Grime *et al.* 1988 p.508.
[518] See below, §8.3.
[519] See below, §8.2.3.
[520] Carr *et al.* 1988 p.375; Murphy & Fryer 2009 p.14.

8.2.3 Flax processing remains

Waterlogged flax remains constitute a particularly high proportion of the quantified macrofossils in samples <WS2>, <BCF4>, <Y50>, <TMS1>, and <BTT1>. In addition, sample <SMB21> from the waterfront at Brandon is chiefly characterized by fibrous material (not quantified) which Murphy and Thomlinson identify as flax processing waste. Some of these flax remains were found in association with wild species which are well known as weeds of flax: stinking flaxweed (*Camelina alyssum* (Mill.) Thell.) in <BCF4>, gold-of-pleasure (*Camelina sativa* L.) in <WS2>, and corn spurrey (*Spergula arvensis* L.) in <BTT2>, <SHF5>, <SHF6>, <TMS1>, <WS2>, and <Y50>.[521] Several of these samples, representing both crop and probable weed content from flax fields, can be interpreted in terms of the processing sequence of flax fibre crops (as opposed to flax crops processed for *culinary* use).

The sequence whereby flax is processed to derive linen fibre is summarized in Table 8.4. By-products from this sequence have been identified in two samples from the waterfront area at Brandon: the abundant seeds and capsule fragments in the charred sample <SMB16> as threshing (beating/rippling) waste, burnt as fuel; and the fibrous stem matter in the waterlogged sample <SMB21> as scutching waste.[522]

Sample <WS2> derives from the primary fill above a wattle hurdle in Well A at Westbury-by-Shenley, and is interpreted by Letts as representing retting waste. It is dominated by seeds, stem and capsule fragments of flax. Given the absence of mature stem and fibre, and the large numbers of both flax and weed seeds, Letts interprets the deposit as representing 'fine stem fragments and capsules of an immature and unrippled crop that broke off the main fibre-stem during the retting stage'. Hence, this deposit may be evidence of an alternative procedure,

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[521] Cappers & Neef 2012 p.122; Letts in Ivens *et al.* 1995 p.424. *Camelina alyssum* is alternatively also known as 'gold-of-pleasure'.

[522] *Cf.* also charred sample <LE2> from Lake End Road: see above, §6.4.2; Murphy & Fryer 2009 pp.8–9.

recorded in Irish customs, in which seed capsules and weed seeds were *not* rippled or beaten from the flax bundles prior to retting, and hence were introduced into retting pools.[523] The timbers and hurdle from this well returned radiocarbon dates all falling within the range cal.AD 653-772.

While there are no other samples with comparably high quantities of waterlogged flax macrofossils recorded in the dataset, <BCF4> from the Early Saxon well at Barton Court Farm and <Y50> from a Mid Saxon well at Yarnton each contain a relatively high proportion of flax remains: 43 capsule fragments and ten seeds in <BCF4> (10 % of total items and fragments in this sample); and 41 capsule fragments and two seeds in <Y50> (6.6% of total). As Robinson suggests with regard to <Y50>, such evidence may plausibly be interpreted as rippling waste disposed of in the wells, with the malodorous retting stage having then taken place further away from the settlement sites.[524]

Indeed, such a retting site has been identified in the Oxey Mead palaeochannel on the Yarnton floodplain, where a waterlogged flax beet (found in association with 65 capsule fragments and 24 seeds of flax), has been discovered and radiocarbon dated to cal.AD 660-890.[525] The co-occurrence here of seeds and capsule fragments with the beet recalls Letts' model of unrippled flax, in the Irish fashion. However, as Robinson argues with regard to the Oxey Mead evidence, it would have been difficult to ripple the short, late-flowering stems that grow from the bases of flax plants. It is therefore possible that some rippling had in fact been performed in these cases, with only the seed capsules from the short stems remaining.[526]

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[523] Letts in Ivens *et al.* 1995 pp.419–422.
[524] Robinson in Hey 2004 p.367.
[525] Robinson in Hey 2004 p.408.
[526] Robinson in Hey 2004 p.408.

Table 8.4 – Summary of flax processing sequence, after Pals & van Dierendonck 1988 p.242, Table 1; Robinson in Hey 2004 p.408; Murphy & Fryer 2009 p.13.

Process		*By-products*
PULLING and twisting into bundles ('beets') ↓		
DRYING to stiffen fibres ↓		
BEATING *or* RIPPLING *i.e.* threshing, to remove capsules and seeds by crushing or combing ↓	→	*Flax capsules (crushed/whole), flax seeds, weed seeds*
RETTING soaking to soften woody stem – a malodorous process likely to be conducted away from settlement foci ↓	→	*Rotting flax remnants, plus aquatic/ ruderal plants, in watery retting pits*
DRYING in open air or kilns ↓		
BRAKING/SCUTCHING to separate fibres from woody remnants ↓	→	*Woody remnants*
SWINGLING to clean out stem by beating and combing ↓	→	*Woody remnants*
HACKLING cleaning and carding ↓	→	*Dust and woody particles*
SPINNING, WEAVING, BLEACHING, *et cetera*		

Although the quantities are far lower, capsule fragments are also a notable occurrence in samples from St Aldate's, Oxford: five capsule fragments (5.7% of total) in <BTT1> from the BT Tunnel site, and nine capsule fragments and two seeds (11.8% of total) in <TMS1> from the Trill Mill Stream site. These samples have been radiocarbon dated to cal.AD 560-890 and cal.AD 680-1020 respectively. While this evidence could conceivably represent rippling by-products dumped in the channels, as proposed above for <BCF4> and <Y50>, Robinson prefers to interpret the St

Aldate's samples as retting waste.[527] The evidence from these samples is paralleled by that from 79-80 St Aldate's. Given the stratigraphic complexities at this latter site, and the fact that the archaeobotanical report presents only semi-quantitative scales of abundance, this material was not systematically recorded in the project dataset. Nonetheless, it may be noted that Sample 524, with its abundance of flax seeds and capsule fragments, could represent further remains of flax retting of probable Mid Saxon date, thus providing a parallel to the evidence at the nearby Trill Mill Stream and BT Tunnel sites.[528]

In one further instance in the study regions, Carruthers suggests that 'a few' waterlogged flax capsule fragments from channel silts at Burghfield may indicate the use of the channel for flax retting.[529] The fragments are not fully quantified, however, nor are they closely datable with the Early/Mid Saxon period.

It is likely that some of the wild taxa represented amongst these flax processing by-products are arable weeds that had grown in the flax fields. However, the informative potential of this weed material, with regard to growing environments and flax cultivation strategies, is very limited: partly because the exploration of chronological and geographical patterns is inhibited by the very small selection of samples identified, and partly because of the inherent difficulty of distinguishing between arable and other origins of wild taxa represented in waterlogged samples, as discussed above. Some species well-known as flax weeds have already been noted (*Camelina* spp. and *Spergula arvensis* L.); other species such as corncockle (*Agrostemma githago* L.) are also likely to have derived from arable fields, their favoured habitat.[530] However, as Letts observes, most of the other wild species typically associated with the waterlogged flax remains might

[527] Robinson in Dodd 2003 pp.370, 382.
[528] Brown in Durham 1977 pp.170–172; Robinson & Wilkinson in Dodd 2003 p.80.
[529] Carruthers in Butterworth & Lobb 1992 pp.156–157.
[530] Stace 2010 p.470.

equally have been 'general weeds of disturbed open habitat and waste ground' rather than arable weeds.[531]

Nonetheless, one particular wild species deserves special mention. It is conspicuous that stinging nettle (*Urtica dioica* L.) is the most numerous taxon in <BCF4> with 172 seeds, and in <Y50> with 238 seeds: in each case, its seeds are more abundant than the flax remains. It is also the most numerous taxon in the sample <SMB19> (70 seeds), and the third most numerous taxon (22 seeds) in <SMB22>, both of which derive from the probable textile processing and dying zone at the waterfront at Brandon. It may further be noted that *Urtica dioica* L. is the most frequently occurring species in the whole waterlogged dataset, occurring in 36 of 41 samples.

While *Urtica dioica* L. could be present in these samples in its capacity as a nitrophilous, ruderal weed, an alternative interpretation is suggested by recent research on retting pits in Denmark. Retting pits from the sites studied by Andresen and Karg, ranging from late Bronze Age to Viking Age in date, frequently contained not only seeds, capsules and stems of flax but also nettle seeds, hemp seeds, or hemp pollen. Flax, hemp and nettle are all fibrous species which require retting before the fibres can be extracted.[532] It is interesting to recall, in this context, the hop/hemp-type pollen recorded from the Yarnton floodplain, and the pollen and fragmentary fruits of hemp discovered in the peat columns from Brandon's waterfront: both areas with strong evidence of flax processing for textile production.[533] It is therefore possible that *Urtica dioica* L. was cultivated/gathered and retted for its fibres, alongside flax and in some cases hemp, at Barton Court Farm in the Early Saxon period, and at Yarnton and Brandon in the Mid Saxon period. In this way, it could be argued that stinging nettle may conceivably be a hitherto unrecognized fibre crop of 5th-9th century agriculture.

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[531] Letts in Ivens *et al.* 1995 p.422.
[532] Troldtoft Andresen & Karg 2011 p.520, Table 1; p.523.
[533] Greig in Hey 2004, p.377; Wiltshire 1990, pp.14-15; Murphy & Fryer 2009 p.13.

8.3 Mineralized plant macrofossils

The mineralized plant remains in the dataset are those preserved through calcium phosphate replacement, which occurs in phosphate-rich deposits such as cess pits and latrines.[534] Hence, this mode of preservation is biased towards food/fodder items such as fruit stones that, once consumed and having survived the digestive process, can occur in faecal deposits.[535] The principal interest of this material is therefore in shedding further light on the plant taxa exploited for consumption in the 5th-9th centuries, whether by humans or animals. Only nine samples, representing four sites, are dominated or jointly dominated by mineralized plant remains (Figure 8.3). Of these nine, only the five from Ipswich are here considered numerically sufficient for quantitative analyses, *i.e.* with ≥30 items (Table 8.5).

Table 8.5 – Samples dominated (or jointly dominated) by mineralized plant macrofossils.

sample	site (+ gazetteer no.)	chronology	no. items		feature type	analyst
			mineralized	charred		
<PT4>	Pitstone (BU11)	Early	1	-	pit	J. Robinson
<IPS10>	Ipswich (SU14)	Mid	223	53	pit	P. Murphy
<IPS17>			19	17	pit/ditch	P. Murphy
<IPS22>			84	150	pit/ditch	P. Murphy
<IPS24>			94	137	pit/ditch	P. Murphy
<IPS8>			17	35	pit	P. Murphy
<WFC2>	Consortium Site (CA7)		7 (+98 frag.)	6	pit	W.J. Carruthers
<WHR4>	Whitehouse Road (SU11)		presence only		pit/ditch	P. Murphy & V. Fryer
<WHR8>			presence only	-	pit/ditch	P. Murphy & V. Fryer

[534] Green 1982 p.40.
[535] Green 1982 p.43.



Figure 8.3 – Map of sites with mineralized plant remains mentioned in text (Digital Mapping Data © Collins Bartholomew 1995).

Despite the small size of the mineralized botanical dataset, it makes a distinct contribution to the known spectrum of potentially useful/edible taxa, whether as cultivars or gathered wild food plants. The results of a basic presence analysis, considering the occurrence of edible taxa in the nine samples listed above, shows that – even within the same deposits – the ranges of species preserved by charring and mineralization are clearly different, in accordance with expected biases (Figure 8.4). Cereal remains are very well represented in the charred component of these samples, but are completely absent from the mineralized component, except for the relatively large amounts of fragmentary cereal bran and straw – sometimes adhering together in concretions – recorded in <WFC2> from the Consortium Site (Ely). While chaff elements such as bran and straw may have been ingested and survived the digestive process (unlike digested grain, which would not survive), it is also possible that straw and other vegetative matter was added to cess *after* initial deposition, as a hygiene measure.[536]

[536] Carruthers in Mudd & Webster 2011 p.115.

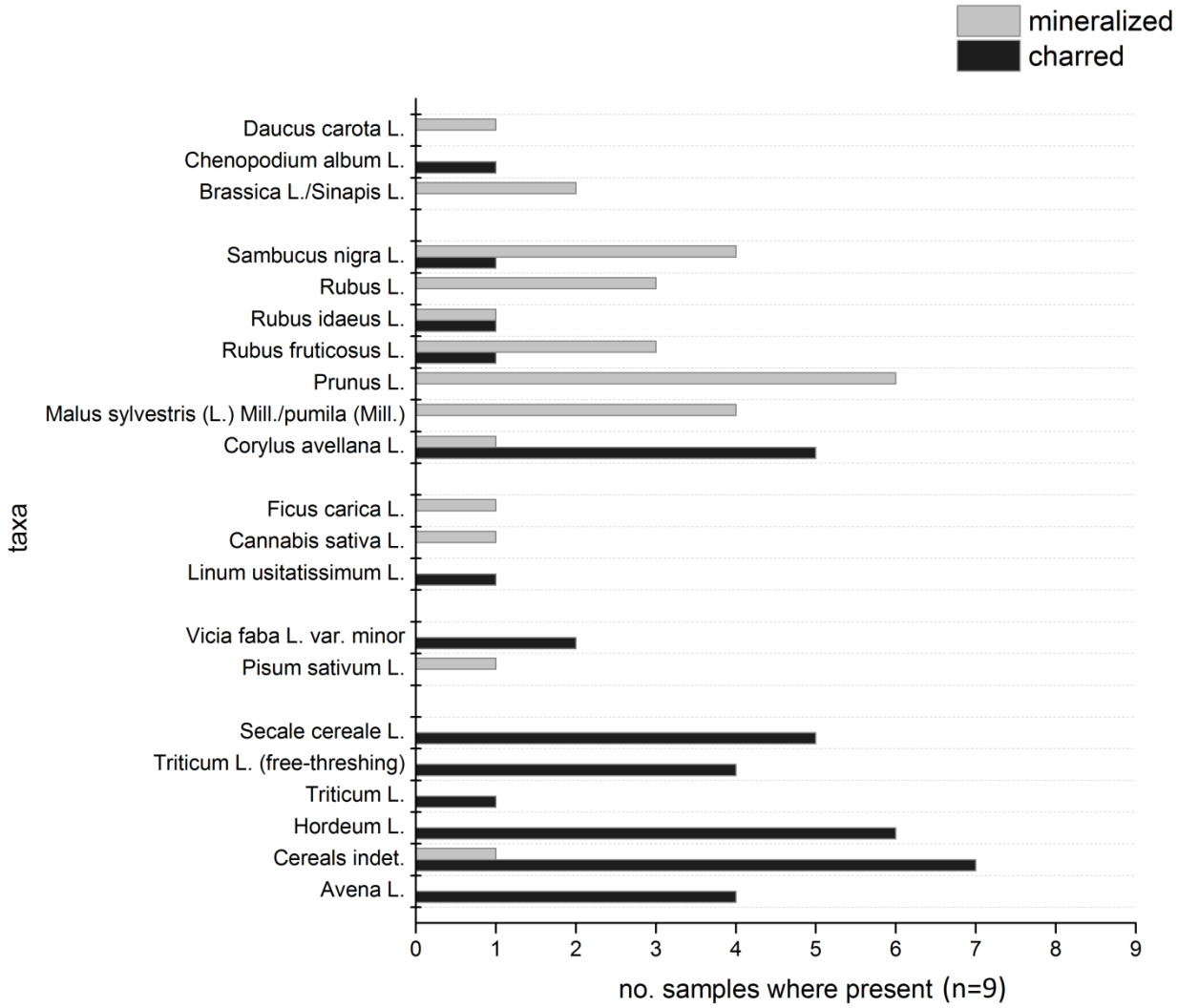


Figure 8.4 – Presence analysis of potentially useful taxa in mineralized samples.

Conversely, fruit-bearing woody species such as apple (*Malus* sp.), bramble (*Rubus* sp.), and elder (*Sambucus nigra* L.) are more often preserved by mineralization than by charring. While there is little functional reason for these taxa to enter the charred botanical record, their seeds may be ingested along with their fruit-flesh, whether by humans or animals, and thus enter the mineralized record. The chief exception is hazel (*Corylus avellana* L.), whose nutshell fragments are frequently charred but seldom mineralized, since the interior of the seed is edible whereas the woody pericarp is not.[537]

[537] Cappers & Neef 2012 p.225.

Also among the mineralized woody taxa is the sole occurrence of fig (*Ficus carica* L.) in the entire project dataset: a single mineralized achene in <IPS22>, from Mid Saxon Ipswich. Given the specialist trading functions attributed to Ipswich in this period, it is possible that figs were imported rather than locally cultivated, as suggested for the walnut remains from Brandon.[538]

Among the herbaceous crop taxa represented, a single mineralized seed of hemp (*Cannabis sativa* L.) in <IPS10> supplements the meagre charred records of this possible crop, also from Ipswich.[539] Hop (*Humulus lupulus* L.), though absent from the mineralized samples listed above, is represented by one mineralized seed in each of the charred samples <IPS6> and <IPS21>. Flax (*Linum usitatissimum* L.) is not represented by any mineralized remains in the dataset.

Other herbaceous edible taxa preserved by mineralization include pulses, carrot (*Daucus carota* L.), and cabbages/mustards (*Brassica* L./*Sinapis* L.). It should be stressed, however, that their occurrence in mineralized form does not necessarily demonstrate that they were deliberately exploited. They may rather have been present as contaminative arable weeds accidentally harvested and consumed with a food/fodder crop, or as local ruderal plants whose seeds casually entered open cess pits by natural means.

[538] See above, §8.2.2; Murphy & Fryer 2009 p.14.
[539] See above, §6.3.4.

8.4 Ceramic plant impressions

Ceramic impressions of plant remains, all of probable Early Saxon date, have been recorded from Walton Vicarage, West Stow, and Mucking, and Pitstone (Figure 8.5). At Mucking, the ceramic impressions constitute the only archaeobotanical resource.[540]

Since ceramic plant impression data are not quantitatively comparable to those from other botanical samples in the dataset, their main relevance here is in revealing the presence of taxa that have eluded preservation by other means. The data are summarized in Table 8.6, which demonstrates that ceramic plant impressions add no new taxa to the dataset, and therefore contribute little additional information regarding agriculture and vegetation history in the 5th-9th centuries. Perhaps the main point of interest is the occurrence of spelt wheat at Mucking, including impressions of whole spikelets. Mucking thus contributes to the growing evidence, discussed above, for the unexpectedly widespread occurrence of spelt wheat, especially in the Early Saxon period, although it cannot necessarily be assumed on this basis that spelt was definitely *cultivated* at Mucking. It may rather have been present only as a persistent volunteer.[541]

[540] See, respectively: M. Monk in Farley 1976 p.173; P. Murphy in West 1985 pp.101–102; M. van der Veen in Hamerow 1993 pp.80–81; J. Robinson in Phillips 2005 pp.24–26.
[541] See above, §6.6.1 and §8.2.2.



Figure 8.5 – Map of sites with ceramic plant impressions mentioned in text (Digital Mapping Data © Collins Bartholomew 1995).

Table 8.6 – Summary of ceramic plant impression data.

taxon / part	Walton Vicarage	West Stow	Mucking	Pitstone
Atriplex L. (seed)			X	
Avena fatua L. (grain)			X	
Avena L. (grain)	X		X	
cf. Avena L. (floret)		X		
Avena sativa L. (grain)			X	
Bromus L. (seed)			X	
Cereals (chaff indet.)			X	
Cereals (grain indet.)		X	X	
Cereals (grains hulled)				X
Fallopia convolvulus (L.) Á. Löve (seed)			X	
Hordeum L. (lemma base)			X	
Hordeum L. (grains, hulled)			X	X
Hordeum L. (grains)	X	X	X	
Hordeum L. (basal nodes)			X	
Hordeum L. (rachis internodes)		X	X	
cf. Hordeum L. (grains)	X	X		
cf. Hordeum L. (lemma)	X			
Vicia L./*Lathyrus* L. (seed)			X	
Pisum sativum L. (seed)			X	
Poaceae (florets)		X		
Pteridophyta (fern frond)			X	
Triticum dicoccum/spelta (grains)			X	
Triticum spelta/aestivum (grains)			X	
cf. Triticum L. (grains)		X		
Triticum sp. free-threshing (grains)			X	
Triticum sp. free-threshing (rachis internodes)			X	
Triticum spelta (grains)			X	
Triticum spelta (glume bases)			X	
Triticum spelta (rachis internodes)			X	
Triticum L. /*Secale* L. (grain)			X	

8.5 Conclusions

The principal contributions of the data discussed in this chapter may be summarized as follows. The range of known possible crops or usable plant taxa has been extended to include wild celery, wild cabbage, dill, ground ivy ('alehoof'), strawberry, walnut and fig. Additional records of rare possible crop taxa such as hemp, hop, and various fruiting woody perennials have also been noted, along with further additions to the corpus of glume wheat occurrences in 5th-9th century contexts, including those at Berinsfield, Mucking, and the Sandon and Stansted palaeochannels. Direct evidence for the processing of flax (and possibly hemp and nettle) for the production of fibres, as well as perhaps the dying of textiles with weld and/or elder, has also been observed, especially at Brandon.

However, the evidential bases behind these observations are slim, and consequently there are few chronological or geographical patterns that can be discerned in each case. The bulk of the evidence for flax processing seems to be 7th century or later in date, with only <BCF4> from Barton Court Farm perhaps representing a lingering persistence of Romano-British flax cultivation into the 5th-6th centuries. No comparable evidence for flax processing in the Early Saxon period, within or beyond the study regions, is known to the author. Flax seeds and capsules representing retting waste at West Cotton (Northants), for example, returned radiocarbon date ranges centred on the 8th century.[542]

Nonetheless, it must be stressed that in total the evidence for flax processing in the study regions is very limited and, with the possible exception of Mid Saxon Brandon where there is a strong circumstantial case for identifying a specialized textile production zone, there is insufficient evidence to support any claim that flax production was a Mid Saxon innovation in the study regions.

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[542] Chapman 2010 p.29.

The same is true of the other, less well represented taxa discussed above. Nevertheless, it is interesting to observe that the macrofossils of a relatively wide range of edible/useful taxa have so far been identified exclusively – or near-exclusively – at Ipswich, including wild celery, dill, fig, strawberry, hemp and hop. Interpretation of this apparently diverse plant diet is complicated by the non-agricultural status of the settlement. Some of these taxa may have been imported (*e.g.* dill, fig), which would account for their localized concentration at a proto-urban craft and trading settlement. Alternatively, local cultivation and supply (or at least deliberate gathering) could account for the presence of these species. Garden cultivation within Ipswich itself is a possibility, just as Crabtree has argued that piglets may have been reared within the settlement 'for home consumption'.[543] On the other hand, it should be emphasised that no other settlement in the project dataset has been so extensively excavated or sampled, or so prolific in mineralized plant remains: hence, no other assemblage is so apt to preserve a wide range of edible taxa as that from Mid Saxon Ipswich. The apparently exceptional diversity of food plants represented at Ipswich could therefore be, to some extent, an artefact of taphonomy.

8.6 Prospect

This chapter concludes the analytical core of this thesis, complementing the studies of crop production and processing presented above in Chapters 6–7. The following chapter provides a synthesis of all observations and conclusions from the foregoing analytical chapters, considered in the context of the models and theories outlined in Chapters 1–2. In this way, it aims to examine the overall emergent patterns of agricultural development in Mid Saxon England, along with their wider implications for current understanding of the period.

[543] Crabtree 2012 p.31.

9 Synthesis & Conclusions

9.1 Introduction

The foregoing chapters have outlined the historical and environmental contexts, and the leading hypotheses advanced in recent literature, that pertain to agricultural development in Mid Saxon England. A series of original analyses of settlement and bioarchaeological data have tested these hypotheses and suggested alternative interpretations for the two selected study regions. In this chapter, the results of these analyses and their implications are summarized and synthesised, to produce a more holistic account of innovations in Mid Saxon farming. It is argued that combining several strands of archaeological evidence allows, for the first time, the formulation of a consistent, compelling, empirically-grounded model of agricultural development in the Mid Saxon period.

The model, based largely upon the evidence from the two selected study regions, is also here considered within the wider contexts of Anglo-Saxon England and early medieval western Europe. Thematically, too, this chapter seeks to look beyond the immediate context of the agricultural landscape, in order to consider the wider socio-economic significance of the proposed agricultural model: in terms of regional and long-distance trade in the 7th-9th centuries, and in terms of the consolidation of new landholding elites and attendant changes in patterns of land ownership and wealth in this period. Finally, some suggestions for future research are put forward.

9.2 Agricultural development: a narrative

The 7th century witnessed profound transformations in Anglo-Saxon society. From a turbulent and shifting political landscape emerged the kingdoms and aristocracies that came to dominate Mid and Late Saxon England, their establishment and consolidation emphatically asserted from the late 6th and early 7th centuries in lavish 'princely' burials (*e.g.* at Prittlewell, Essex), and settlement complexes with great halls and planned layouts (*e.g.* at Cowdery's Down, Hants), wherein gift-giving and feasting both rewarded and cemented the loyalty of royal retainers.[544] By the later 7th century the major Anglo-Saxon kingdoms were well established, and their itinerant kings were issuing law-codes, granting tracts of land, and gathering food-rents as they traversed their subject territories.[545]

This was also a period of Christian conversion, nominally complete across the Anglo-Saxon kingdoms by the 680s.[546] Under the influence of both Roman and Irish churches, the Anglo-Saxon élites gradually brought themselves and their kingdoms within the ambit of western Christendom, its culture, connections, literacy and learning: fertile ground for the exchange of materials and ideas, whether sacred or secular. The minsters that embodied Mid Saxon Christianity became, from the late 7th century onwards, the first recorded beneficiaries of 'bookland'. This was the institution whereby land – or, more specifically, the right to extract goods and services from those occupying the land – could be granted in perpetuity by charter. Such land-rights presumably encouraged, perhaps for the first time since the Roman period, long-term investment in the productivity of these enduring estates.[547]

Likewise the non-élite landscape of settlement and burial, falling under new governance and sometimes changing hands by royal writ, underwent significant developments in this period.

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[544] Wickham 2009 pp.157–158; Welch 2011 pp.269–275; Hamerow 2012 p.102.
[545] Wormald 1999 p.279; Faith 1999 p.181; Wickham 2009 pp.158–160.
[546] Blair 2005 pp.9–49.
[547] Blair 2005 pp.84–88; Faith 1997 p.30; Wormald 1984 pp.19–23.

Buildings began to exhibit greater variation in shape, size, construction methods and function – as indeed did entire settlements, some of which also displayed greater spatial organization and definition, greater stability than their 'shifting' precursors, and in some cases a greater propensity to occupy heavier soils than appears to have been the case in the Early Saxon period.[548] Meanwhile, a closer integration between settlement and burial spaces from the mid-7th century onwards could, as Hamerow suggests, have helped to legitimize ancestral claims to specific areas of land.[549] This phenomenon could thus, in tandem with growing settlement stability and the introduction of bookland, reflect the increasing importance attached to proprietary land-rights in this period.

Among the new settlement types of the Mid Saxon period, inland markets and coastal *emporia* mark a radical departure from the relatively localised and autarkic rural economies of Early Saxon England, representing nodes in a new network of specialist craft production and trade, and eventually some degree of monetization.[550] Following a hiatus in coin-use in the 5th-6th centuries, monetary currency returned to southern Britain first as the Merovingian and English gold tremisses of *c.*AD 580-675, with a heavily eastwards, coastal distribution; and later the Frisian and English silver sceattas (*c.*AD 680-750) gradually attained a prolific distribution far inland as well as along the east coast, indicating a growing degree of monetized exchange. The early 8th century is also remarkable for the sustained, specialist mass production and widespread distribution of Ipswich Ware, the first wheel-turned, kiln-fired pottery manufactured in southern Britain since the Roman period. Changes in craft production were not restricted to ceramics. The production of standardized metal dress accessories also appears to have grown in the 8th-9th centuries, while at sites such as Ramsbury (Wilts) and Wittering (Cambs) there is evidence for

[548] Hamerow 2012 pp.22–24, 67–119; Ulmschneider 2011 pp.160–165; Blair 2013; Arnold & Wardle 1981; Newman 1992 pp.30–35.
[549] Hamerow 2012 p.129.
[550] Pestell 2011.

specialist iron-smelting.[551] Overall, then, it may be said that the production and exchange of various craft goods became more intensive, specialized and organized in the Mid Saxon period.

To this catalogue of transformations in society, culture, settlement and economy must be added the crucial process of *agricultural development*, which is seen to begin at some point in the 7th century and continue through the 8th and 9th centuries. This process was surely integral to the dislocations and innovations in settlement patterns, to the changes in economic activity, and to the shifting political and intellectual climates outlined above. Farming was perforce the ubiquitous constant of Anglo-Saxon life, and agricultural development the ultimate catalyst for socio-economic change: it is now possible to propose a cohesive, archaeologically-based model of how agricultural development was achieved in Mid Saxon England.

It is essential to preface this model with some consideration of 5th-6th century farming in southern Britain. For this period, two separate spheres of agricultural activity can be identified. The first can be described as 'Early Saxon', without necessarily implying any exclusive ethnic connotations. This is the mode of farming evidenced in association with Early Saxon material culture and settlement remains, *e.g.* at Mucking or West Stow. It is characterized by relatively small-scale crop husbandry focused principally upon hulled barley and free-threshing wheat, conducted primarily upon lighter, easily-worked soils.[552] Heavy ploughs would not therefore have been necessary, although they would still have afforded an advantage by upsetting weed growth; their usage cannot be disproved but may reasonably be deemed unlikely in an otherwise 'low intensity' arable regime.[553] Animal husbandry, meanwhile, was largely unspecialized and probably extensive, in the sense that livestock (with the possible exception of sty-reared pigs) was not closely managed in terms of spatial control, breeding, or culling patterns. Rather, in most

[551] Naylor 2012 pp.248–252; Blinkhorn 2012; Thomas 2011b pp.412–414.
[552] See above, *e.g.* §6.6.2.
[553] Williamson 2003 p.121.

instances the evidence is consistent with Crabtree's model of self-sufficient Early Saxon pastoralism.[554]

The second, more shadowy sphere of agricultural activity in the 5th-6th centuries can be described as 'Very Late Roman' farming, the nature and extent of which remain doggedly obscure. It is the agricultural counterpart to the post-Roman persistence at urban sites posited by Henig: an evolution of Late Roman forms and functions following the end of imperial governance, but without any abrupt hiatus immediately around *c.*AD 410.[555] Thus at Alchester, for example, traces survive of an agrarian system capable of producing dense concentrations of charred cereals – including large quantities of spelt wheat – in a monumental grain oven; that is, an agrarian system of 'Roman' rather than Early Saxon appearance, but nonetheless of probable 5th century date.[556] In other manifestations, one finds 'Very Late Roman' granaries, flax cultivation, and animal husbandry regimes strongly focused upon particular species, *e.g.* ovicaprids in the Cotswolds.[557] Such evidence is currently very limited and variable, although it is worth noting that the growing body of evidence for the preservation of Romano-British field divisions into the medieval period tells similarly against any major agricultural dislocation immediately upon formal Roman withdrawal.[558]

Transitions in agricultural practices – as in all aspects of Late Roman society – remain poorly dated and inadequately understood. It is provisionally suggested here that 'Very Late Roman' and Early Saxon modes of agriculture co-existed in different parts of southern Britain in the 5th century, with the 'Very Late Roman' mode ultimately declining in scale and intensity as

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[554] See above, §5.4.1. Crabtree 2010 pp.10–12.
[555] Henig 2011.
[556] See above, §7.3.2.
[557] See above, §§5.3, 7.3.2, 8.2.3.
[558] *E.g.* Upex 2002.

relict urban and military demands dwindled, and political and economic infrastructures deteriorated or simplified.[559]

It is against this backdrop that agricultural innovations, precipitating enhancements in productivity, commenced in the 7th century and continued apace into the 8th and 9th, with some regional variations but an overall consistency of direction. The fundamental innovation driving agricultural development in this period has recently been characterized as a shift away from the heavily pastoral, low-intensity 'abatement' of Early Saxon farming, to the more intensive arable expansion of the Mid Saxon period.[560] This model is, in essence, borne out by the findings of the present study, although the model proposed here differs in some important details (*e.g.* chronology) from that described by Faith.

The palynological and sedimentary studies considered in Chapter 4 suggested an increase in the extent of arable land from around the 7th century in East Anglia and the 8th century further west. Meanwhile, as alluded to above, settlement distributions indicate a Mid Saxon reoccupation of formerly abandoned terrains such as heavy clays in river valleys and the roddons of the silt Fens.[561] The archaeobotanical evidence studied in Chapter 7 contributes further to this emerging picture of arable expansion onto new soils. Presence analyses of arable weeds such as stinking chamomile (*Anthemis cotula*) and spike-rush (*Eleocharis palustris/uniglumis*) – whose increases in presence are among the highest of any potential weed species in the dataset – imply an expansion of cultivation onto heavy clays and other poorly-drained soils, potentially as early as the 7th and especially by the 8th-9th centuries, throughout both of the regions studied in this thesis.[562] By implication, the heavy mouldboard plough must have been available by this period,

[559] Esmonde Cleary 2011 pp.17–18.
[560] Faith 2009 pp.37–39.
[561] See above, §4.6. Moreland 2000 pp.82–83.
[562] See above, §6.7.1.

or else such heavy soils could not have been effectively tilled; this inference is made materially manifest in the Lyminge coulter find (Kent), of early 7th century date.[563]

Yet this was not simply a process of homogeneous expansion – 'more of the same' – but rather a pattern of *adaptive* growth, whereby both crop spectra and husbandry strategies were adapted to maximise the productive potential of land newly brought under the plough. The innovations may be outlined as followed.

Firstly, it is argued here that the decisive change in cereal farming was not, as often asserted, the replacement of hulled barley by bread wheat as the most important cereal crop of Mid Saxon England (as in the 'bread wheat thesis'). Rather, both hulled barley and wheat (the vast majority of which is highly likely to represent a free-threshing variety) are ubiquitous and abundant in the archaeobotanical record for both Early *and* Mid Saxon periods, with little evident change in their relative importance during these periods.[564] This assertion does not necessarily contradict the documentary evidence cited by Banham and Hagen for wheat's high prestige relative to barley in Anglo-Saxon culture.[565] The lower cultural value of barley does not mean, *a priori*, that less would have been grown (or preserved archaeologically). On the contrary, studies of early medieval Irish crop husbandry have demonstrated an inverse relationship between documented cultural status and archaeobotanical ubiquity: wheat and rye are ascribed high status in a medico-legal text of the period, but register the lowest archaeobotanical presence, whereas the converse is true for oats and barley – their very ubiquity may in fact have militated against cultural prestige.[566]

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[563] Williamson 2003 p.121; Thomas & Knox 2012.

[564] See above, §6.6.2. While the constancy and relative abundance of positively identified free-threshing wheat macrofossils *do* increase over time, it is argued that this largely reflects an increase in the identifiability of wheat remains over time; the importance of wheat *sensu lato*, relative to barley, changes very little.

[565] Hagen 2006 pp.30–35; Banham 2010 pp.176–179.

[566] Monk *et al.* 1998 p.73.

In fact, the most striking innovations in Mid Saxon cereal farming concerned the persistently minor crops – rye and oats – which, although never challenging the predominance of barley and free-threshing wheat, nonetheless increased greatly in both presence and relative abundance from the 7th century onwards, especially in East Anglia. While oat's status as a cultivar is open to question in most instances, its abundance in several Mid Saxon samples and the form of its floret bases in some others (especially at Lyminge) speak strongly in support of its deliberate cultivation; it may have been grown for use in brewing, among other purposes.[567]

It is likely that environmental influences played a key role in directing changes in the relative importance of the different cereals in Anglo-Saxon crop husbandry, as suggested by regional patterning in their archaeobotanical representation. Thus, for example, barley is particularly associated with the silt fens, rye with the sandy Breckland, and free-threshing wheat with the peat fens and clay vales. The implication is that the known ecological profiles of modern landraces – barley's salt-tolerance, rye's drought-resistance, free-threshing wheat's capacity to thrive on heavy soils – are probably valid also for the early medieval period, and that Mid Saxon farmers adapted their cropping regimes accordingly to ensure maximal cereal harvests within the capabilities and limitations of available farmland.[568]

The simultaneous cultivation of taxa with different ecological profiles (as in mixed or 'maslin' cultivation) may well have been adopted as a risk-buffering strategy, to ensure that at least one of the crops sown would yield a reasonable harvest, however poor the weather during the growing season. Such may have been the case at Lyminge and Ipswich, whose archaeobotanical assemblages display the greatest 'balance' between all four of the free-threshing cereals, both within and between individual samples. An alternative risk-buffering

[567] See above, §6.3.1 and Appendix 3.
[568] M. Jones 1981 pp.105–108; Moffett 2006 p.48, Table 4.3; Murphy 2010 p.215.

strategy is suggested by the archaeobotanical evidence at Yarnton and Ely, where wheat-rich crops on clayey soils were probably spring-sown so as to avert the risk of winter waterlogging.[569]

While the key changes identified in the archaeobotanical record therefore undoubtedly concern free-threshing cereals, it is possible to identify a much wider – albeit less well represented – diversification of crop husbandry in the Mid Saxon period. Glume wheats, for instance, despite a traditional assumption that they played little or no part in the cropping regimes of Anglo-Saxon England, show increasingly convincing signs of post-Roman persistence in cultivation. This not only applies to 'Very Late Roman' spelt cultivation as witnessed at Alchester, but also to localized concentrations of spelt and emmer occurring as late as the 8th-9th centuries at some sites. Emmer cultivation may even represent an Early/Mid Saxon innovation in the Upper and Middle Thames valley.[570]

It has been suggested above that the glume wheats' greater natural resistance to spoilage may have rendered them particularly suitable for prolonged storage and/or transportation, and therefore found most often in association with markets (*e.g.* Dorney), estate centres (*e.g.* Lyminge, Great Wakering), or other sites with high-status associations (*e.g.* Yarnton).[571] This suggestion raises the intriguing possibility that crops were selected, not only in response to environmental and cultural factors, but also with due consideration to future economic purpose, *e.g.* as food-rent or marketable surplus. While this model necessarily implies that glume wheats were cultivated at a wider range of sites (*i.e.* the rural 'producer sites'), it also posits that their storage and processing in bulk, and therefore greater vulnerability to preservation by charring, were concentrated at the recipient markets or estate centres.

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[569] See above, §6.6.2, 6.7.2.
[570] See above, §6.6.1.
[571] See above, §6.6.1.

Besides cereals, there are several non-cereal crops which are less likely to be preserved by charring but which nonetheless display – in pollen sequences, waterlogged and mineralized remains, plus occasional charred occurrences – a marked increase (or indeed first appearance) from the 7th century onwards: *e.g.* opium poppy, hop, dill, walnut and fig. These taxa tend to be associated with high-status sites, and the latter two, in particular, could represent imported goods rather than local crops. Viticulture was introduced to East Anglia perhaps as early as the 7th century; and grapes were reaching high-status consumers in the Upper/Middle Thames valley from the 7th/8th century onwards, although these may have been imported as raisins rather than grown locally.[572]

The best represented non-cereal crop, however, is flax, whose cultivation and processing for fibre-production increased from the 7th century onwards, as attested by (admittedly sparse) waterlogged and occasional charred remains. In addition, there is some evidence for the cultivation of hemp, nettle and dye-plants (weld and elder) as contemporary innovations in the agricultural production of textiles.[573] The strongest archaeobotanical evidence for specialist textile production is from the (probably ecclesiastical) settlement at Brandon, whence also derives compelling zooarchaeological evidence for specialist wool production.[574] Brandon's faunal assemblage exemplifies the wider phenomena identifiable in Mid Saxon animal husbandry: the growth of specialization, and the increasing importance of sheep.

Specialized herd management was an innovation of the 7th century onwards, and is evident to varying degrees for cattle, ovicaprids and pigs. In most instances, the evidence suggests a focus upon secondary products (*e.g.* milk, wool and, crucially, traction for ploughing), although a focus upon meat is occasionally suggested. There is a nascent regional pattern in these data, whereby

[572] See above, §§4.6, 6.3.4.
[573] See above, §8.2.
[574] See above, §§5.4, 8.2.

the secondary products of cattle and sheep appear to have been more important in East Anglia/Essex, whereas assemblages suggestive of prime meat production tend to lie more to the west of the study regions. The exception to the latter observation is Wicken Bonhunt (Essex), where specialist pork production is strongly – indeed, uniquely – evidenced.[575]

Zooarchaeological data also suggest, in accordance with much recent scholarship, that sheep do appear to have gained importance somewhat (at the expense of cattle) from the 7th century onwards, but not to the extent of total predominance. On the contrary, cattle, ovicaprids, and pigs were all of some importance throughout the study regions between the 5th and 9th centuries. Some regional variation is apparent, with higher proportions of ovicaprids occurring to the north and west of the study regions (especially around the catchment of the Great Ouse), and cattle to the south and east (especially around the clays of central East Anglia, Essex, and the London Basin).[576] This division seems to correspond roughly with the distribution of Late Saxon woodland, as gleaned from Domesday and toponymic data, with sheep tending to be more associated with the less heavily wooded (and therefore, presumably, more extensively arable) zone.[577] The connection, if any, could be that in areas which underwent the greatest arable expansion in the Mid Saxon period, pastures became increasingly confined to poorer soils less suitable for arable or cattle farming (*e.g.* chalk downland) – but capable of supporting flocks of sheep.[578]

The same 'sheep-rich' zone is further characterized by another 7th-9th century innovation: droveway and paddock complexes, and the (plausibly related) phenomenon of 'penning elbow' on sheep long bones. All such evidence points towards the closer spatial management of livestock in these regions; this would be consonant with the proposed expansion of arable land at the

[575] See above, §5.3.
[576] See above, §5.3.
[577] Williamson 2003 pp.52–58.
[578] Williamson 2003 pp.79–80, 125.

expense of pasturage, and a consequent need to prevent animals from straying onto cultivated ground – a contingency subject to legislation to late 7th century Wessex.[579] By the same token, spatial control of livestock will have protected hay meadows, as evidenced at Yarnton, which will in turn have facilitated the foddering of livestock at settlements over the winter. Ultimately, this system will also have facilitated the collection of manure for the enrichment of arable fields, a process which could well account for the increased presence of nitrophilous weed species such as nettle and henbane in the archaeobotanical record from the 7th century onwards.[580]

The most striking result of these various interlocking processes is that, by the late 7th/early 8th century onwards, greater arable surpluses were clearly being produced, stored and processed, as evidenced not only by the first occurrence of dense concentrations of charred cereal grain in the archaeological record since the 'Very Late Roman' period, but also by the renewed construction of specialist crop-storage facilities, grain ovens, and watermills. All of this evidence reflects a larger scale – or at least the centralization – of crop production, storage and processing in Mid Saxon England.

In sum, the different strands of evidence together support a narrative of expansion and diversification in arable farming, and specialization in animal husbandry. The discussion now turns to consider the wider geographical and social contexts of this narrative.

[579] Ine's law code, c.42: Stenton 1971 pp.279–280.
[580] See above, §6.7.1. Hamerow 2012 pp.148–149; Booth *et al.* 2007 pp.331–333.

9.3 National and European contexts

While the above narrative is based upon the evidence from only two selected study regions within Anglo-Saxon England, it fits well within the wider national context; relevant sites outside the study regions are mapped in Figure 9.1. Admittedly the national picture remains biased towards southern and eastern Britain, where the archaeological record for the period is strongest.[581] Nonetheless, comparative material is available from several sites far removed from the regions studied in this thesis, and spanning several of the Anglo-Saxon kingdoms.

For instance, the small national sample of Mid Saxon watermills displays a very wide distribution and some chronological consistency, with the earliest dating to the late 7th/early 8th centuries: Wellington (Herefs), Ebbsfleet (Kent), Barking (Gt. London), and Worgret (Dorset), and later Corbridge (Northumberland) and Tamworth (Staffs).[582] Where ascertainable, these structures appear to be associated with royal (*e.g.* Tamworth) or ecclesiastical (*e.g.* Barking) complexes.

Large grain ovens outside the study regions likewise appear to represent a genuine Mid Saxon innovation. Indeed, the monumental grain ovens dating from this period, studied in Chapter 7, at Feltham (Middlesex), Gillingham (Dorset), and Higham Ferrers (Northants) all lie outside the study regions. While no further examples corresponding closely to their dimensions are known to the author, other ovens of great size and similar date have been found at Hoddom (Dumfriesshire – a monastic centre), Raunds Furnells (Northants – precursor to a Late Saxon manorial complex), Sherburn (Yorks – later a royal vill), and Hereford (an episcopal seat and early

[581] See, for example, the map in Hamerow *et al.* 2011 p.xxviii; Blair 2013a pp.5-8.
[582] Denison 2001; Blair 2005 p.256; MacGowan 1996; Tyers in Andrews, Biddulph, Hardy & Brown 2011 pp.92–3; Rahtz & Meeson 1992; Snape 2003.

town), besides Mid/Late Saxon examples at Ebbsfleet (Kent) and Chalton Manor Farm (Hants).[583] Once again, where ascertainable, these sites have high-status or ecclesiastical associations.

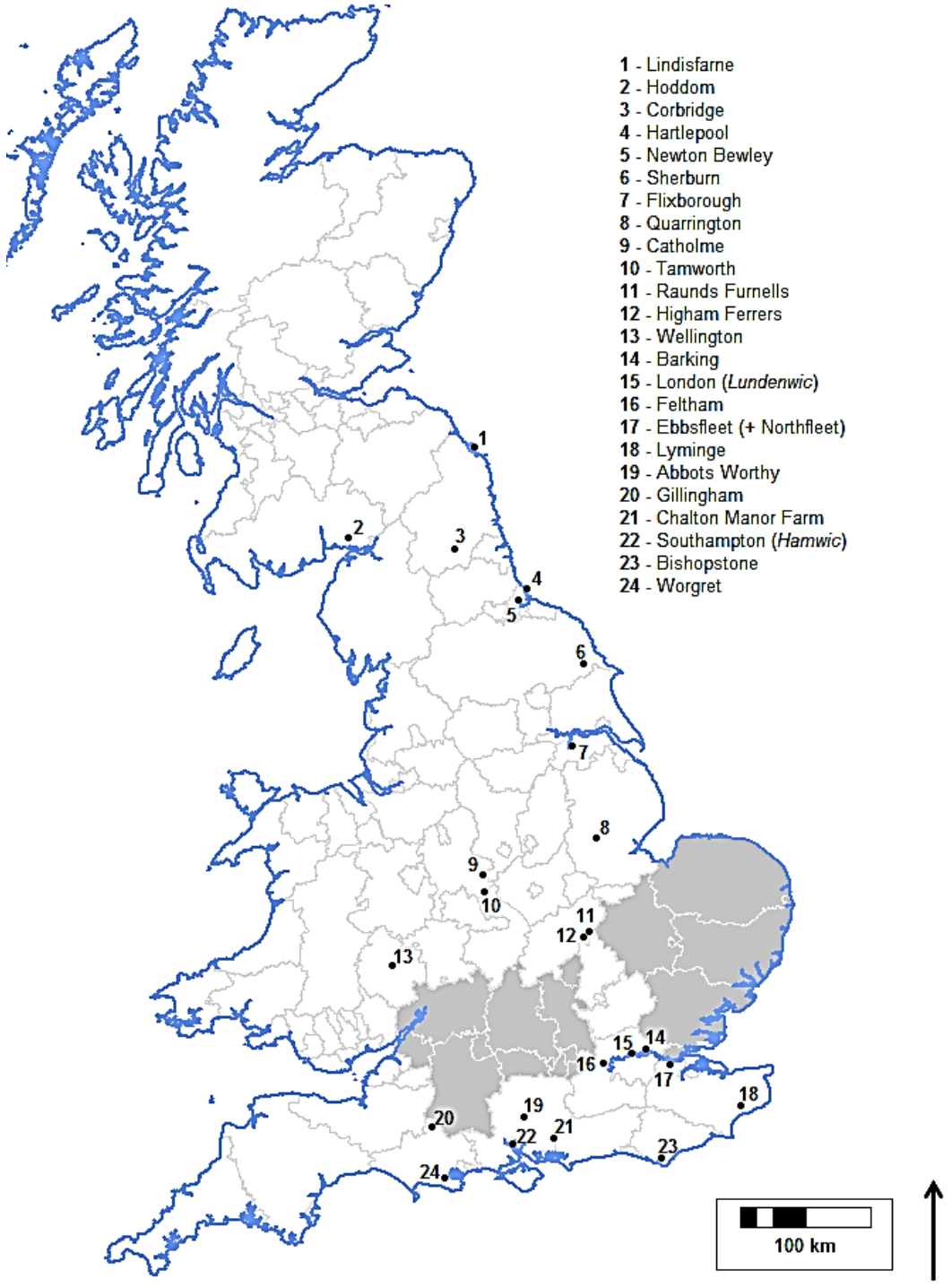


Figure 9.1 - Map of relevant sites lying outside the study regions (shaded), as mentioned in text (Digital Mapping Data © Collins Bartholomew 1995).

[583] Holden in Lowe 2006 pp.100–106; Audouy & Chapman 2009 p.66; Powlesland 2011 pp.6–7; Shoesmith 1982 pp.30–32; Andrews, Biddulph, Hardy & Brown 2011 p.285; Hughes 1984 p.72.

Synthetic statistical studies of charred crop remains, comparable to those undertaken in this study, are not yet available for other regions of Britain. Nonetheless, there are indications that some of the archaeobotanical patterns observed here find parallels elsewhere in Anglo-Saxon England. In the south-west, for instance, sedimentary and palynological evidence in Devon indicate a marked increase in arable farming around the 7th-8th centuries.[584] Elsewhere, spelt macrofossils which occasionally occur in post-Roman contexts tend to be associated with either a 'Very Late Roman' or else a high-status Mid Saxon milieu, *e.g.* at the former Roman villa site at Northfleet (Kent), where spelt is radiocarbon-dated to cal.AD 400-580; at Newton Bewley, a Mid Saxon site in the immediate hinterland of monastic Hartlepool (Co. Durham); and at the estate centre at Bishopstone (Sussex), where it is radiocarbon-dated to cal.AD 687-895 (at 93.9% confidence).[585] Other, rarer possible cultivars such as opium poppy, flax, fig, plum, apple and lentil seem to show a restricted distribution, variously including monastic Hartlepool, the estate centre at Bishopstone, and the *emporia* at Southampton and London.[586] An unusually diverse spectrum of cultivated/edible taxa (including spelt) is also represented at Abbots Worthy (Hants), a site of uncertain date and status, but whose probable cess pits and rectilinear enclosure would certainly be consistent with a high-status Mid Saxon settlement. The site also produced rare charred evidence for hay-making.[587]

Zooarchaeological and settlement studies, meanwhile, suggest that the observed trends in animal husbandry were not restricted to the study regions. At Catholme (Staffs), for instance, where occupation spans at least the early 7th to late 9th centuries, some of the ditched features

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[584] Rippon *et al.* 2006.
[585] Smith & Stafford in Andrews, Mepham, Schuster & Stevens 2011 p.304; Huntley & Rackham in Daniels 2007 pp.108–123; Ballantyne in Thomas 2010 pp.164–176.
[586] Huntley & Rackham in Daniels 2007 pp.108–123; Ballantyne in Thomas 2010 pp.164–176; Carruthers, Hunter & Clapham in Birbeck 2005 pp.145–185; Davis in Cowie *et al.* 2012 pp.144–146.
[587] Carruthers in Fasham & Whinney 1991 pp.67–75.

appear to be analogous to the droveways or paddocks discussed in Chapter 5.[588] At Quarrington (Lincs), the construction of a Mid Saxon enclosure complex accompanied a pronounced shift in the zooarchaeological record, including an increase in the proportion of ovicaprid bones at the expense of pig, and an increased emphasis upon secondary products.[589] Ovicaprid bones are also found to dominate the assemblages from the estate centre at Bishopstone (Sussex), and the monastic sites at Hartlepool (Co. Durham) and the Prebendal, Aylesbury (Bucks).[590] Perhaps most striking of all, however, is the evidence from the early 9th century phase at Flixborough (Lincs), where *styli* and a lead inscription reinforce Blair's interpretation of the site as a probable minster.[591] This phase yielded an abundance of small loomweights, and a faunal assemblage which indicates an increased emphasis on sheep, besides the introduction of a new, unprecedentedly large breed of cattle. A greater emphasis upon the production of woollen textiles has reasonably been inferred from this evidence, and comparable artefactual and zooarchaeological signs are also now emerging from 8th-9th century (monastic) levels at Lyminge.[592]

Yet such tendencies towards the growing importance of sheep and wool should not be exaggerated: the pattern is neither universal nor exclusive – even among ecclesiastical sites. On Lindisfarne, for instance, a very different – indeed, exceptional – instance of a highly structured cull occurs at the Green Shiel site, where a deposit of juvenile and neonatal calves is interpreted as possible evidence for vellum production for the island's Mid Saxon minster.[593] Extant manuscripts themselves imply the existence of very extensive herds, capable of supplying large

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[588] See above, §5.5. Hamerow in Losco-Bradley & Kinsley 2002 p.126.
[589] Taylor 2003, esp. pp.271-272
[590] Poole in Thomas 2010 pp.142–154; Huntley & Rackham in Daniels 2007 pp.108–123; G. Jones in Farley & Jones 2012 pp.97–104 – the Prebendal site falls within the study regions, but was published too late to be fully incorporated into the main analyses.
[591] Blair 2005 pp.206–209.
[592] Loveluck 2007 pp.96–102; Dobney *et al.* 2007 pp.160–5; Thomas 2013 p.137.
[593] O'Sullivan 2001 p.42.

numbers of calf skins to monastic *scriptoria*.[594] The Green Shiel assemblage might thus offer a rare glimpse into the sustained importance of cattle in some parts of the landscape: perhaps representing an alternative direction in Mid Saxon pastoral specialization.

Such is the evidence that similar processes of agricultural development to those identified within the study regions also took place more widely within Mid Saxon England. However, there are also several aspects of the developmental model that fit well within a much wider context, suggesting that Mid Saxon agriculture was engaging in transformations that embraced much of contemporary north-western Europe. Most fundamentally, there is evidence for a widespread increase in arable production around the 7th-9th centuries. In Ireland, such evidence includes a general increase in charred crop assemblages and in the construction of both watermills and grain ovens (especially in the 7th and 8th centuries).[595] These changes were accompanied by a shift in emphasis in cereal cultivation in favour of oats, and a more general diversification of crop spectra to include *e.g.* pulses and flax – all of which innovations find close parallels in Mid Saxon England.[596]

For north-western continental Europe, meanwhile, Hamerow cites evidence for increasing grain-storage capacities at rural settlements, the laying-out of new field systems, the intensive practice of 'turf manuring', and an associated widespread increase in the cultivation of rye.[597] Indeed, rye becomes the predominant cereal crop of the 8th-10th centuries in north-western continental Europe, and not simply in the sandy regions to whose soil it was especially well suited; the importance of oats as a summer crop is also thought to have increased in this

[594] Hamerow 2002 pp.151–152.
[595] McCormick *et al.* 2011, pp.33-34, 39-40. Monk & Power 2012 p.38 demonstrate a slightly different chronology for grain ovens, with a 5th-8th century *floruit*, peaking in the 6th century.
[596] McCormick *et al.* 2011 pp.56–58.
[597] Hamerow 2002 pp.139–147.

period.[598] The general patterns are thus strikingly similar to those seen in Mid Saxon England, with surpluses increasing and a growing importance attached to oats and rye.

Moreover, Carolingian documentary sources record how mills proliferated in the 7th-9th centuries, along with breweries, bakeries and other productive appurtenances, especially at monasteries.[599] While no excavated Carolingian grain ovens are known to the author, such structures appear to have been sufficiently prestigious – or widespread – in 9th century Francia to be included on the idealised monastic St. Gall plan: labelled '*locus ad torrendas annonas*', and situated opposite a granary.[600] In animal husbandry, too, parallels with Mid Saxon developments may be found: faunal data from northern France indicate a growing emphasis on sheep husbandry around the 9th century.[601]

In addition, the argument that post-Roman glume wheat cultivation may have persisted in particular association with high-status establishments finds some support in the Frankish evidence. Bakels compares charred plant remains from Carolingian sites in northern France with the documentary evidence of the *Brevium Exempla* (*c.*AD 810, containing a survey of royal estates), and identifies a discrepancy between the two sources: spelt appears to have been the most important cereal (milled into flour) at the royal sites documented in the *Brevium Exempla*, but is generally rare in the archaeobotanical record; the converse is true of bread-type wheat.[602] The discrepancy remains to be fully explained, but could plausibly relate to status: *i.e.* it is possible that the royal sites recorded in the *Brevium Exempla* had preferential access to spelt, whereas the excavated sites in Bakels' survey (of undocumented status) did not.

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[598] Behre 1992 pp.148–150; Hamerow 2002 pp.134–137; Henning (forthcoming).
[599] Lebecq 2000 p.134.
[600] <http://www.stgallplan.org>, accessed Oct. 2013.
[601] Unpublished study by Yvenic & Chaulet, cited by Crabtree 2010 p.129.
[602] Bakels 2005 pp.397–398.

Such are some of the common aspects of agricultural development in temperate north-western Europe in the 7th-9th centuries. Contemporary developments in Mediterranean Europe appear somewhat different, but there are some noteworthy points of convergence. At the most general level, field surveys, geoarchaeology and palaeoenvironmental studies indicate the clearance of woodland and other vegetation to open up new farmland around the 8th century in southern France, Byzantine Italy, and al-Andalus (the Iberian peninsula under Arabic rule).[603] Yet in terms of the crop species cultivated upon this farmland, there are considerable differences from temperate Europe. Ruas, for example, observes that rye's relative importance in northern France is not paralleled in the Mediterranean south, while the agricultural intensification in Byzantine Italy appears to have been focused more upon grapes and olives.[604] In short, while agricultural development seems to have been characteristic of the 'long eighth century' in many different parts of western Europe, the particular course of development taken in the temperate north-west appears somewhat discrete and distinctive – no doubt adapted to both the climatic and cultural commonalities within this quarter of early medieval Christendom.

[603] Ruas 2005 p.401; Arthur *et al.* 2012 pp.445–449; Puy & Balbo 2013 pp.46–51.
[604] Ruas 2005 p.407; Arthur *et al.* 2012 pp.446–451.

9.4 Agricultural development and Mid Saxon society

Having outlined a coherent model of agricultural development and its counterparts elsewhere in Anglo-Saxon England, Ireland, and continental Europe, it remains to consider what causal relationships – if any – exist between agricultural change and the two key areas of transformation elsewhere in Mid Saxon society: the economic (associated with *emporia*, markets, money, production and exchange) and the political (associated with kingship, lordship, minsters and land grants).

First, however, it is necessary to address an apparent contradiction in the proposed narrative of agricultural development. It has been argued that the enhancement of arable production entailed both *extensification*, *i.e.* an increase in the physical extent of land under cultivation, and *intensification*, *i.e.* an increase in the amount of labour and resources invested in a given land unit (*e.g.* heavy ploughing). In theory, these two strategies are mutually exclusive; van der Veen and O'Connor describe them as opposites.[605] In practice, however, the two models can be reconciled if the available pool of labour and resources was growing in tandem with the expansion of arable land. In other words, substantial demographic growth is a prerequisite of the proposed model of agricultural development.

Since a rise in surplus production will itself have increased the capacity for demographic growth, the whole process is likely to have been, to some extent, self-sustaining. Yet it is also clear that Mid Saxon agrarian surpluses fed into other channels too, beyond simply nourishing and clothing a growing rural population.

Discussion of economic intensification in Mid Saxon England has long been dominated by the *wics* or *emporia*, settlements specializing in craft production and exchange, which must have relied upon rural communities producing sufficient surpluses to supply much of their basic needs.

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[605] See above, §2.2; van der Veen & O'Connor 1998 pp.127–128.

It remains an open question, however, as to how these settlements interacted with their rural hinterlands.

To what extent can the *emporia* be seen as a direct stimulus to agricultural development? Substantivist perspectives on the *emporia*,[606] in the tradition of Hodges' influential work, emphasise the character of Mid Saxon goods exchange as a royally-controlled venture undertaken for 'political' purposes, embedded in socio-political structures concerned with the controlled redistribution of imported prestige goods.[607] Saunders takes this view so far as to argue that the *emporia* were 'divorced from the rural economy': provisioned indirectly via food-renders, with no direct economic interaction with their rural hinterlands.[608] In support of this argument, he cites zooarchaeological studies of *Hamwic* (Southampton) and *Eoforwic* (York). The faunal assemblages from these *emporia* are characterized chiefly by low species-diversity and a preponderance of cattle, particularly those past prime meat-bearing age. On this basis, a lack of consumer choice is inferred, rendering a direct stimulus to agricultural development unlikely.[609]

However, a number of objections to this model can be raised. Firstly, there is no incontrovertible reason to assume that 'old' meat was necessarily undesirable. As Hamerow notes, similar mortality profiles characterise faunal assemblages from some later medieval towns, which are not thought to have been royally provisioned.[610] Rather, as this thesis and other studies have argued, there is a recurrent tendency at Mid Saxon sites for more cattle and sheep to be kept into maturity than had hitherto been the case, a pattern which is plausibly due to an increased emphasis upon secondary animal products. It could therefore be inferred that the demand for wool, traction and dairy products outweighed the demand for prime meat; this does

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[606] *Sensu* Polanyi 1957 pp.245–250.
[607] Hodges 1982 pp.50–54.
[608] Saunders 2001 pp.12–13.
[609] Saunders 2001 p.13; Bourdillon 1994 pp.122–124; O'Connor 2001 pp.58–60; Hamerow 2007 pp.219–222.
[610] Hamerow 2007 p.228.

not necessarily mean that meat *per se* was not marketed, but rather that most of the available meat will have been butchered from older animals. In any case, the mandibular mortality profiles for Ipswich's cattle, ovicaprids and pigs do not seem to conform to the *Hamwic*-type model, and the same is true of the mandibles from *Lundenwic*.[611]

Moreover, this perspective arguably places too much emphasis upon meat, when in fact plant foods – and above all, cereals – are likely to have been of greater nutritional importance to most Mid Saxon diets.[612] Significantly, the archaeobotanical evidence indicates none of the 'monotony' identified in faunal assemblages. On the contrary, no site within the study regions has yielded a greater diversity of edible plants than Ipswich: including not only exotica such as fig and dill, which may have been imported, but also hemp and hop, whose cultivation in Mid Saxon England is attested elsewhere by palynological evidence. This botanical diversity is strikingly paralleled by the archaeobotanical assemblages from *Lundenwic* and *Hamwic*, where not only hemp, hop, dill, wild celery, fig and grape, but also coriander, caraway, oregano, sage and the Mediterranean herb Alexanders are represented.[613] While the coincidence of various taphonomic factors could account for the greater diversity of edible taxa represented at *emporia*,[614] the fact remains that this very diversity of foods and flavourings contrasts strongly with the comparatively restricted meat diet, and would arguably be more consistent with market supply than with 'monotonous' royal provisioning.

Ipswich was not, therefore, 'divorced' from rural producers. On the contrary, it very much appears to have been in receipt of the products of Mid Saxon agricultural development: to wit, mature livestock and a wide range of food plants. This does not necessarily mean, however, that the intensification of trade and craft production represented by the *emporia* was a prime stimulus

[611] See above, §5.4; Crabtree 2012, pp.25-42; Hamerow 2007 pp.221–223.
[612] Banham 2004 p.13.
[613] Green 1994 pp.84–87; Biddle in Andrews 1997 p.246; Carruthers, Hunter & Clapham in Birbeck 2005 pp.145–185; Davis in Cowie *et al.* 2012 pp.144–146.
[614] Moffett 2011, p.353.

for agricultural development.[615] It is now increasingly recognized that the *emporia* existed within a wider network of inland markets (of which Dorney may be a rare excavated example) and rural settlements, some of which were engaged in specialist crafts in the 8th-9th centuries, such as the iron-working site at Ramsbury – thought to be associated with a royal vill, and later an episcopal seat.[616] According to current interpretations, the *floruit* of economic intensification in this network can be dated to the early/mid-8th century, when the *emporia* were established as large, planned settlements hosting intensive craft production and goods exchange; and when the monetization of southern and eastern Britain, which had commenced in the later 7th century, was consolidated in the Secondary *sceatta* phase.[617] This 8th-century *floruit* of craft production and monetized exchange thus appears, according to the provisional chronology adopted by this project, to *post*-date the beginnings of agricultural development, which appears to have begun in the 7th century.[618]

It is therefore possible to argue that the wider economic intensifications of the 8th century, as represented in particular by the *emporia* and inland coin distributions, were *not* the primary stimulus for agricultural development, a process which was already underway by that time. In this way, the sequence proposed by Moreland is essentially borne out by the current study: a wider set of transformations in the sphere of production (including agriculture) preceded the intensifications represented at the *emporia* and inland 'productive sites'.[619] It remains to be considered whether or not the 'hidden hands' suggested by Moreland – *i.e.* landed and especially ecclesiastical élites – can be identified as the original stimulus for agricultural development in the 7th century.

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[615] *E.g.* Metcalf 1984 p.27; Ulmschneider & Pestell 2003; Naylor 2004 pp.122–134; Hamerow 2007 p.226.
[616] Ulmschneider & Pestell 2003; Hamerow 2007 p.226; Blinkhorn 2012 pp.90–99; Haslam *et al.* 1980.
[617] Naylor 2012 pp.246–253.
[618] That is, the earliest evidence of innovation belongs to the 'Intermediate' chronological class (*c.*AD 600+).
[619] Moreland 2000 pp.101–104.

Royal, aristocratic and monastic landowners can be seen to have had the means, motives, and opportunities to encourage agricultural development in Mid Saxon England. The need for agricultural surpluses to be procured in food rents – as documented in, for example, the late 7th century laws of King Ine of Wessex – represents a strong incentive for enhancements in productive capacity.[620] In the case of ecclesiastical landlords, the need to acquire specialist goods – such as vestments, vellum and wine – may have contributed further to the need for a tradable agricultural surplus.[621] Thirdly, the introduction of 'bookland' as documented, perpetual landholdings – evidenced for ecclesiastical beneficiaries from the late 7th century, and for secular landlords from the late 8th century – would have provided the incentive for long-term investments in the productivity of the land.[622]

Hence, there are strong circumstantial grounds for supposing that, from the time of their consolidation from the early/mid-7th century onwards, Anglo-Saxon élites would and could have taken a keen interest in the agricultural productivity of their dependent lands. This supposition finds further corroboration in a few contemporary documentary sources, secular and ecclesiastical, which offer some clue as to élite perspectives on the land. From the later 7th century onwards, the first charters not only record the permanence of estates given as 'bookland', but also detail their productive appurtenances, *e.g.* 'fields, woods, meadows, pastures, fisheries, rivers, springs'.[623] Moreover, the opening passages of Bede's *Historia Ecclesiastica* (AD 731) give primacy to the productivity of Britain's crops, trees, pastures, vines, birds, rivers, springs and coasts, and likewise to the natural resources of Ireland; a literary trope,

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[620] *EHD* no.32, 70.1; Blinkhorn 1999 pp.12–3. See above, §1.2.
[621] Blair 2005 pp.251–61.
[622] Faith 1997 pp.159–61.
[623] *EHD* no.58.

perhaps, but the passages nonetheless include specific details about, *e.g.* whelk-dyes and hay-making.[624]

In such circumstances, it is no surprise to find that, if the various innovations and their respective occurrences at different sites in the study regions are tabulated, some correlation with status emerges (Table 9.1). The sites with the most evidence for agricultural innovations tend to be those for which high (and/or ecclesiastical) status can be argued on independent grounds. The settlements at Lyminge, Ely, Eynsham, North Elmham Park and Great Wakering, for instance, can all be plausibly associated with documented Mid Saxon ecclesiastical establishments, and artefactual evidence for literacy and ecclesiastical metalwork suggest that Brandon was also monastic.[625] A royal palace is later attested at Old Windsor, and a similar interpretation is consistent with the known archaeological remains from the Mid Saxon phase. Ipswich Ware and continental pottery at Dorney suggest that, if it was indeed the site of a market as suggested by the excavators, then it was a market at which high-status goods were traded. The interpretation of Yarnton remains uncertain, but the occurrence here of Ipswich Ware far beyond its core distribution zone again hints at high status; and it has even been conjectured that the settlement may have been a dependency of the nearby minster at Eynsham, but this lacks direct supporting evidence.[626]

It therefore appears that the agricultural innovations highlighted in this study frequently occur in association with other potential indicators of high status. Indeed, it is likely that many of the proposed innovations in Mid Saxon agriculture required such a scale of investment (in both labour and materials) and such a degree of planning, that the influence of landed élites might be assumed *a priori*. Large enclosure complexes, watermills, and monumental grain ovens must have

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[624] *HE* I.1.
[625] Blair 2005 p.206.
[626] Hey 2004 pp.90–91.

required great initial outlay and coordination. Blair has identified the work of surveyors using common metric standards (the 'short perch') in the laying-out of Mid and Late Saxon settlements, perhaps beginning at minsters, reviving classical traditions of surveying.[627] Such practices could help to explain the apparent similarities in plan between some of the droveway/paddock complexes examined this study (Figure 9.2).

[627] Blair 2013b.

Table 9.1 – Evidence for selected agricultural innovations at sites in the project dataset. Tentatively identified innovations are denoted by '(x)', *e.g.* the 'millstone' at Dorney; highlighted sites are thought to be of high and/or ecclesiastical status (see text).

	rare taxa	fibre/dye crops	emmer/spelt	dense charred samples	specialist storage	grain oven	droveway/paddock	specialist animal husbandry	watermill
Yarnton	x	x	x	x	x	x	x		
Lyminge	x		x	x	x	x		(x)	
Dorney	x	x	x	x					(x)
Ely (West Fen Rd/Chiefs St)			x	x		x	x	x	
Brandon	x	x		x					
Eynsham	x					x		x	
Harston Mill	(x)		x	x			x		
Hutchison Site	x		x	x					
Pennyland				x			x	x	
Wicken Bonhunt					x		(x)	x	(x)
Wolverton Turn						x		x	
Forbury House	x			x					
Great Wakering			x			x			
Brandon Road North			x			x			
Godmanchester							x	x	
Sedgeford						x		x	
North Elmham Park						x		x	
Bloodmoor Hill								x	
Old Windsor									x
Cottenham							x		
Lakenheath							x		
Cherry Orton Road							x		
Fordham							x		
Downham Market							x		
Rosemary Lane				x					
Collingbourne Ducis									
Terrington St Clement							x		
Walpole St. Andrew				x					
Ingleborough				x					
Wantage							x		
Lechlade							x		
Gamlingay							x		
Westbury-by-Shenley		x							
Oxford (St Aldate's)		x							
Ipswich	x								
Lackford Bridge Quarry				x					
Bletchley							x		

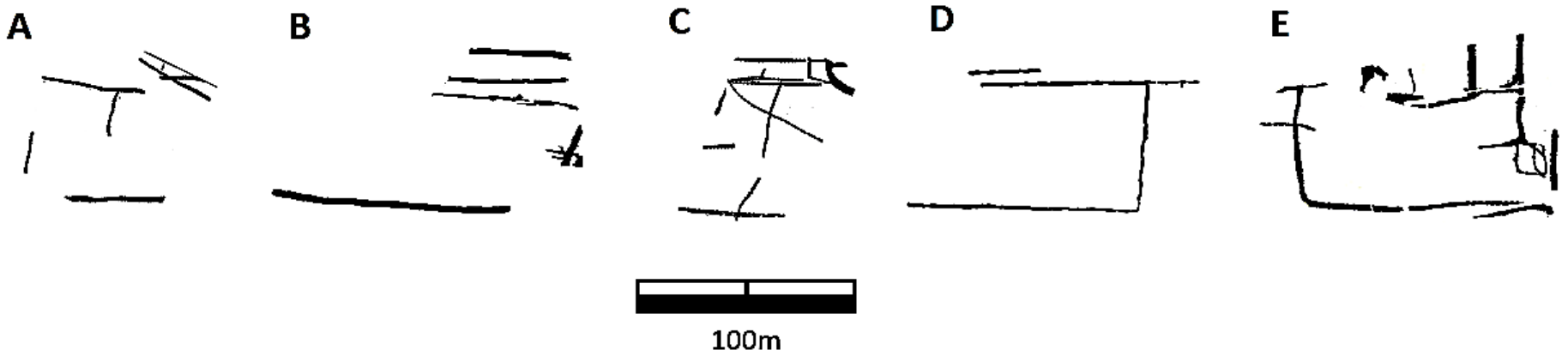


Figure 9.2 – Excerpts from plans of selected droveway/paddock complexes in the study regions: (A) Gamlingay, after Murray 2005, p.182, fig.10; (B) Harston Mill, after O'Brien (in press), fig.6.1; (C) Lechlade, after Bateman *et al*. 2003, p.41, fig.12; (D) Pennyland, after Williams 1993, p.94, fig.52; (E) Yarnton, after Hey 2004, p.20, fig.1.5.

Comparable principles could apply in the case of monumental grain ovens which, it has been argued, display morphometric similarities in both Romano-British and Mid Saxon periods, suggestive of standardized commissions.[628] It is even possible to argue, albeit tentatively, that Late Roman oven-building traditions directly influenced those adopted in Mid Saxon England, given the similarity in size between the drying chamber at Higham Ferrers (Northants) and some of Late Roman date, *e.g.* Goring (Oxon) and Rogging (southern Germany): see Figure 9.3. Perhaps such dimensions were once specified in manuals by Roman agronomists, now lost.

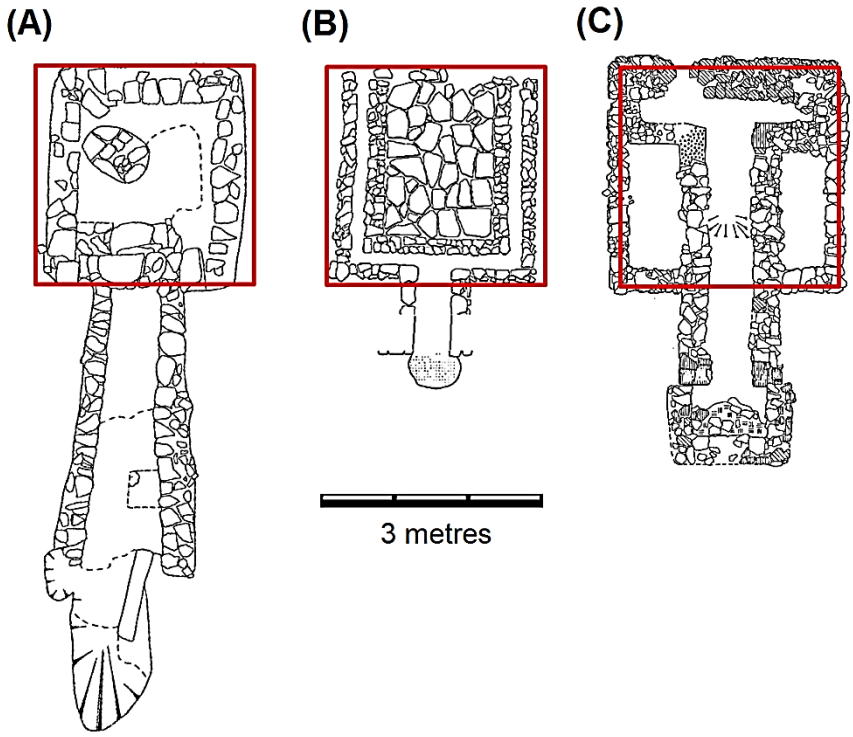


Figure 9.3 – Plans of grain ovens at (A) Higham Ferrers, after Hardy *et al.* 2007 p.52, Fig.3.33; (B) Rogging, southern Germany, after Fischer 1990 p.321, Fig.157; (C) Goring, after Allen *et al.* 1995 p.41, fig.30.

While the potential significance of peasant-level cooperation and coordination, and the possibility of collective investment in and management of communal resources (*e.g.* ovens or ploughs), should not be dismissed, there are some aspects of agricultural development which seem genuinely most consonant with direct élite involvement. Above all, the argument that has been made for *ideological* investments – the cultural capital that may have been invested in

[628] See above, §7.3.2.

'landscapes of production' at Mid Saxon estate centres, as formerly at Romano-British villas – implies that landlords held some concern for improvements in agricultural productivity.[629] Moreover, it is the élites, and above all the ecclesiastical élites, who will have had privileged access to the intellectual, cultural, material and technological influences of both Ireland and Carolingian Europe, whose agricultural developments so often mirror – and perhaps in some cases inspired – those of Mid Saxon England.

[629] See above, §7.3.2; *cf.* Purcell 1995 pp.167-173.

9.5 Conclusions

While it may be fanciful to imagine a Mid Saxon abbot crossing the channel to France in search of masons to build him a monumental grain oven 'in the Roman manner that he loved' – as Benedict Biscop famously did for his church at Wearmouth – the general model proposed here is nonetheless consistent with the archaeological and documentary evidence assembled in this thesis.[630] It seems likely that the demands and opportunities arising from a growing population, newly consolidated landlords, and an intensifying network of craft production and goods exchange, all benefited from and contributed to agricultural development. Agricultural development was thus a process which ultimately fuelled the key transformations which England underwent in the Mid Saxon period, and one in which élites, both secular and especially ecclesiastical, keenly participated, as did their counterparts across the Irish Sea and English Channel. The fruits of agricultural development – above all, cereal grain and wool – could be stored, amassed, transported and redistributed in surplus; their growing importance can be seen to represent a change in the nature of wealth, directly associated with contemporary changes in proprietary land-rights, from the 7th century onwards.[631]

Yet there remains much more to be understood in the study of Anglo-Saxon farming. The most logical extension of this work would be to expand its geographical scope both within and beyond Anglo-Saxon England, and to draw more comparisons between regions and periods. There is potential for the application of the statistical methods employed in this study (*e.g.* correspondence analysis) to more faunal and botanical assemblages of the period. In addition, stable isotope analyses of both animal bones and charred crop deposits could shed light on such hitherto obscure topics as foddering and manuring.[632] Above all, however, there is an urgent need for direct dating evidence, especially for 'controversial' taxa such as spelt, but also for Early and

[630] *HAB* 5.
[631] *Cf.* McCormick 2008 pp.220–222.
[632] Fraser *et al.* 2011.

Mid Saxon remains more generally. Greater reliability and precision in the chronology of this period would be of immense use to future studies.

British grain ovens are also in need of a new synthetic study: not only those of early medieval date, but also Romano-British, later medieval, and post-medieval examples. There is clear potential for a morphometric/typological study, drawing comparisons with examples from contemporary Ireland and continental Europe; and also for an updated review of archaeobotanical remains from grain ovens, building upon van der Veen's seminal work.[633] Likewise, a systematic re-examination of quern/millstone finds could help to elucidate developments in milling in the Romano-British and Anglo-Saxon periods, building upon the studies by Wilson.[634]

Archaeological research into Anglo-Saxon agriculture has until recently been somewhat neglected. It is hoped that this study has demonstrated, not only the great potential for utilizing a wealth of new data in the construction of new models, but also the wider significance of this topic in terms of Anglo-Saxon chronology, culture, economy and environment. Anglo-Saxon England must be seen as a society of farmers, and archaeology is increasingly allowing us to do so as never before.

[633] van der Veen 1989.
[634] Wilson 2007.

Appendix 1: Gazetteer of Sites

Notes

All maps: Digital Mapping Data © Collins Bartholomew 1995.

Unless otherwise referenced, zooarchaeological and archaeobotanical analyses appear within the main referenced works for each site.

Elevation is measured in metres above Ordnance Datum, as stated in the main referenced works or read from maps. Figures should be taken as approximations/averages.

Omitted site plans were either unavailable to the author at the time of writing, or displayed too few features to warrant reproduction.

Site Index

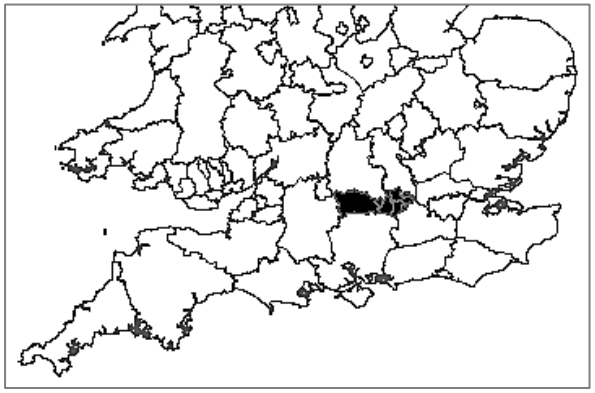
Site name	Code	County
Abbey Wharf	BE3	Berkshire
Alchester	OX3	Oxfordshire
Ashbury	OX19	Oxfordshire
Ashwell Site (Ely)	CA8	Cambridgeshire
Audlett Drive	OX23	Oxfordshire
Bancroft	BU5	Buckinghamshire
Barnsley Park	GL4	Gloucestershire
Barrow Hills	OX21	Oxfordshire
Barton Court Farm	OX22	Oxfordshire
Bassingbourn	CA26	Cambridgeshire
Beech House Hotel	OX27	Oxfordshire
Benson	OX17	Oxfordshire
Berinsfield	OX25	Oxfordshire
Bicester	OX2	Oxfordshire
Bishop's Cleeve	GL2	Gloucestershire
Bishop's Court	OX26	Oxfordshire
Bletchley	BU10	Buckinghamshire
Bloodmoor Hill	SU2	Suffolk
Bowthorpe	NO9	Norfolk
Brandon	SU5	Suffolk
Brandon Road North	NO17	Norfolk
Brandon Road South	NO19	Norfolk
Brettenham	NO20	Norfolk
Brimpton	BE8	Berkshire
Burghfield	BE4	Berkshire
Caister-on-Sea	NO10	Norfolk
Castor	CA2	Cambridgeshire
Chadwell St Mary	ES11	Essex
Cherry Orton Road	CA4	Cambridgeshire
Chiefs Street (Ely)	CA9	Cambridgeshire
Chieveley	BE6	Berkshire
Chicheley	BU1	Buckinghamshire
Childerley Gate	CA18	Cambridgeshire
Churchill Farm	OX1	Oxfordshire
Cogges	OX5	Oxfordshire
Collingbourne Ducis	WL6	Wiltshire
Consortium Site (Ely)	CA7	Cambridgeshire
Cookham	BE1	Berkshire
Cotswold Community	WL1	Wiltshire
Cottenham	CA13	Cambridgeshire

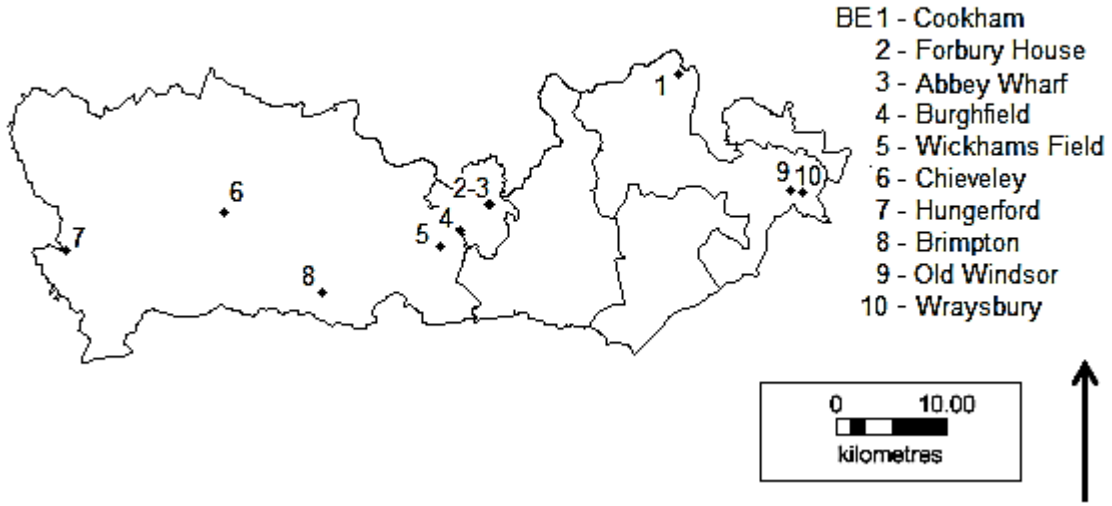
Site name	Code	County
Cresswell Field	OX9	Oxfordshire
Criminology Site	CA19	Cambridgeshire
Didcot	OX31	Oxfordshire
Dorney (see *Lake End Road* and *Lot's Hole*)	BU21-22	Buckinghamshire
Downham Market Bypass	NO12	Norfolk
Dumbleton	GL1	Gloucestershire
Duxford	CA29	Cambridgeshire
Eaton Socon	CA15	Cambridgeshire
Elmlea	CA3	Cambridgeshire
Ely (see *Chiefs St, Ashwell Site, Consortium Site*)	CA7-9	Cambridgeshire
Eye	SU4	Suffolk
Eynesbury	CA16	Cambridgeshire
Eynsham	OX7	Oxfordshire
Fenny Lock	BU9	Buckinghamshire
Flixton Park Quarry	SU3	Suffolk
Forbury House	BE2	Berkshire
Fordham	CA10	Cambridgeshire
Fowlmere	CA25	Cambridgeshire
Friston	SU10	Suffolk
Frocester Court	GL5	Gloucestershire
Gamlingay	CA22	Cambridgeshire
Godmanchester	CA11	Cambridgeshire
Goring	OX20	Oxfordshire
Great Linford	BU2	Buckinghamshire
Great Wakering	ES9	Essex
Handford Road	SU13	Suffolk
Harston Mill	CA23	Cambridgeshire
Hartigans	BU6	Buckinghamshire
Heybridge	ES8	Essex
High Post	WL8	Wiltshire
Hintlesham	SU12	Suffolk
Hinxton Hall	CA30	Cambridgeshire
Hinxton Quarry	CA28	Cambridgeshire
Hungerford	BE7	Berkshire
Hutchison Site	CA21	Cambridgeshire
Ingleborough	NO7	Norfolk
Ipswich	SU14	Suffolk
Kilverstone	NO16	Norfolk
Lackford Bridge Quarry	SU8	Suffolk
Lake End Road (Dorney)	BU22	Buckinghamshire
Lakenheath Dental Clinic	SU6	Suffolk
Latimer	BU19	Buckinghamshire

Site name	Code	County
Latton Quarry	WL2	Wiltshire
Lechlade	GL7	Gloucestershire
Little Oakley	ES2	Essex
Littlemore	OX14	Oxfordshire
London Road (Downham Market)	NO13	Norfolk
Lordship Farm	CA27	Cambridgeshire
Lot's Hole (Dorney)	BU21	Buckinghamshire
Lower Cambourne	CA17	Cambridgeshire
Lower Icknield Way	BU18	Buckinghamshire
Lower Slaughter	GL3	Gloucestershire
Marham	NO8	Norfolk
Market Lavington	WL5	Wiltshire
Millets Farm	OX16	Oxfordshire
Mucking	ES10	Essex
Neptune Wood	OX29	Oxfordshire
New Wintles Farm	OX6	Oxfordshire
North Elmham Park	NO3	Norfolk
Old Castle Inn	OX28	Oxfordshire
Old Windsor	BE9	Berkshire
Orton Hall Farm	CA5	Cambridgeshire
Outwell	NO11	Norfolk
Pampisford	CA24	Cambridgeshire
Pennyland	BU3	Buckinghamshire
Pitstone	BU11	Buckinghamshire
RAF Lakenheath	SU7	Suffolk
Ramsbury	WL4	Wiltshire
Redcastle Furze	NO18	Norfolk
Rosemary Lane	CA20	Cambridgeshire
Rycote	OX15	Oxfordshire
Scole	SU1	Suffolk
Sedgeford	NO1	Norfolk
Shakenoak	OX4	Oxfordshire
Slough House Farm	ES7	Essex
Spong Hill	NO4	Norfolk
Spring Road	OX24	Oxfordshire
St Aldate's (BT Tunnel)	OX12	Oxfordshire
St Aldate's 79-80	OX11	Oxfordshire
St Aldate's 89-91 (Trill Mill Stream)	OX13	Oxfordshire
Stansted Airport	ES3	Essex
Stansted Carpark	ES4	Essex
Stonea Grange	CA6	Cambridgeshire
Sutton Courtenay	OX30	Oxfordshire

Site name	Code	County
Takeley	ES5	Essex
Taplow Court	BU20	Buckinghamshire
Terrington St Clement	NO5	Norfolk
The Strood	ES6	Essex
Tidworth	WL7	Wiltshire
Two Mile Bottom	NO15	Norfolk
Uley	GL6	Gloucestershire
Upper Wanborough	WL3	Wiltshire
Walpole St Andrew	NO6	Norfolk
Walton Lodge	BU15	Buckinghamshire
Walton Lodge Lane	BU14	Buckinghamshire
Walton Orchard	BU13	Buckinghamshire
Walton Road Stores	BU12	Buckinghamshire
Walton Street	BU17	Buckinghamshire
Walton Vicarage	BU16	Buckinghamshire
Wantage	OX18	Oxfordshire
Waterbeach	CA14	Cambridgeshire
Wavendon Gate	BU7	Buckinghamshire
West Stow	SU9	Suffolk
Westbury-by-Shenley	BU8	Buckinghamshire
Whitehouse Road	SU11	Suffolk
Wicken Bonhunt	ES1	Essex
Wickhams Field	BE5	Berkshire
Willingham	CA12	Cambridgeshire
Wilton	WL9	Wiltshire
Wittering	CA1	Cambridgeshire
Witton	NO2	Norfolk
Wolverton Turn	BU4	Buckinghamshire
Worton	OX8	Oxfordshire
Wraysbury	BE10	Berkshire
Wymondham	NO14	Norfolk
Yarnton	OX10	Oxfordshire

Berkshire




BE 1 - Cookham
2 - Forbury House
3 - Abbey Wharf
4 - Burghfield
5 - Wickhams Field
6 - Chieveley
7 - Hungerford
8 - Brimpton
9 - Old Windsor
10 - Wraysbury
1
2-3
4
5
6
7
8
9
10
0
10.00
kilometres

BE1: **Cookham** (The Pound)
NGR: SU 8905 8525
Main reference: Mundin 2008
Zooarchaeology: C. Falys
Archaeobotany: n/a
Elevation: 28
Geology: Taplow Gravel terrace in Middle Thames valley.
Summary: Gully and two pits containing Early/Mid Saxon (6^{th}-9^{th} c.) pottery; faunal assemblage from pit. Contemporaneity of bones and pottery is tenuous.

BE2: **Forbury House** (Reading)
NGR: SU 7180 7350
Main reference: Edwards 2008
Zooarchaeology: n/a
Archaeobotany: Vaughan-Williams 2005
Elevation: 42
Geology: Taplow Gravel terrace in Kennet valley, near confluence with Thames.
Summary: Two pits, one containing a sherd of hand-made Anglo-Saxon pottery with a burnished interior; the other producing charred plant remains, plus charcoal C14-dated to cal.AD 630-960 (at 95% confidence).

BE3: **Abbey Wharf** (Reading)
NGR: SU 719 734
Main reference: Hawkes & Fasham 1997
Zooarchaeology: J. Coy
Archaeobotany: n/a
Elevation: 35
Geology: Alluvial silts in Kennet valley, beside Taplow Gravels.
Summary: Animal bone assemblage recovered from deposits containing Early/Mid Saxon sandy and micaceous organic-tempered potsherds.

BE4: **Burghfield** (Anslow's Cottages)
NGR: SU 693 710
Main reference: Butterworth & Lobb 1992
Zooarchaeology: J. Coy
Archaeobotany: W.J. Carruthers
Elevation: 39
Geology: Gravels and adjacent alluvial floodplain deposits in Kennet valley.
Summary: Timbers in palaeochannel C14-dated to cal. AD 565-770, 550-760 and 640-880 (at 95% confidence); environmental samples were taken from associated channel deposits.

BE5:	**Wickhams Field**
NGR:	SU 6750 6970
Main reference:	Crockett 1996
Zooarchaeology:	S. Hamilton-Dyer
Archaeobotany:	R. Scaife
Elevation:	43
Geology:	Pits on higher sandy ground of Reading Beds; wells on lower valley gravels; band of colluvium in between.
Summary:	Three pits and two timber-lined wells. A well timber was C14-dated to cal.AD 650-870; the other well was considered contemporary on morphological grounds. The small ceramic assemblage (14 sherds, organic-tempered) from the pits would be consistent with a similar 7th-9th century date.

BE6:	**Chieveley**
NGR:	SU 479 727
Main reference:	Mudd 2007
Zooarchaeology:	n/a
Archaeobotany:	V. Fryer
Elevation:	108
Geology:	Mixed sands, clays and gravels of the Reading Beds, in drainage basin of the Lambourn.
Summary:	Groups of pits dated, somewhat tenuously, by a small assemblage of organic-tempered pottery to the Early/Mid Saxon period (6th-9th centuries).

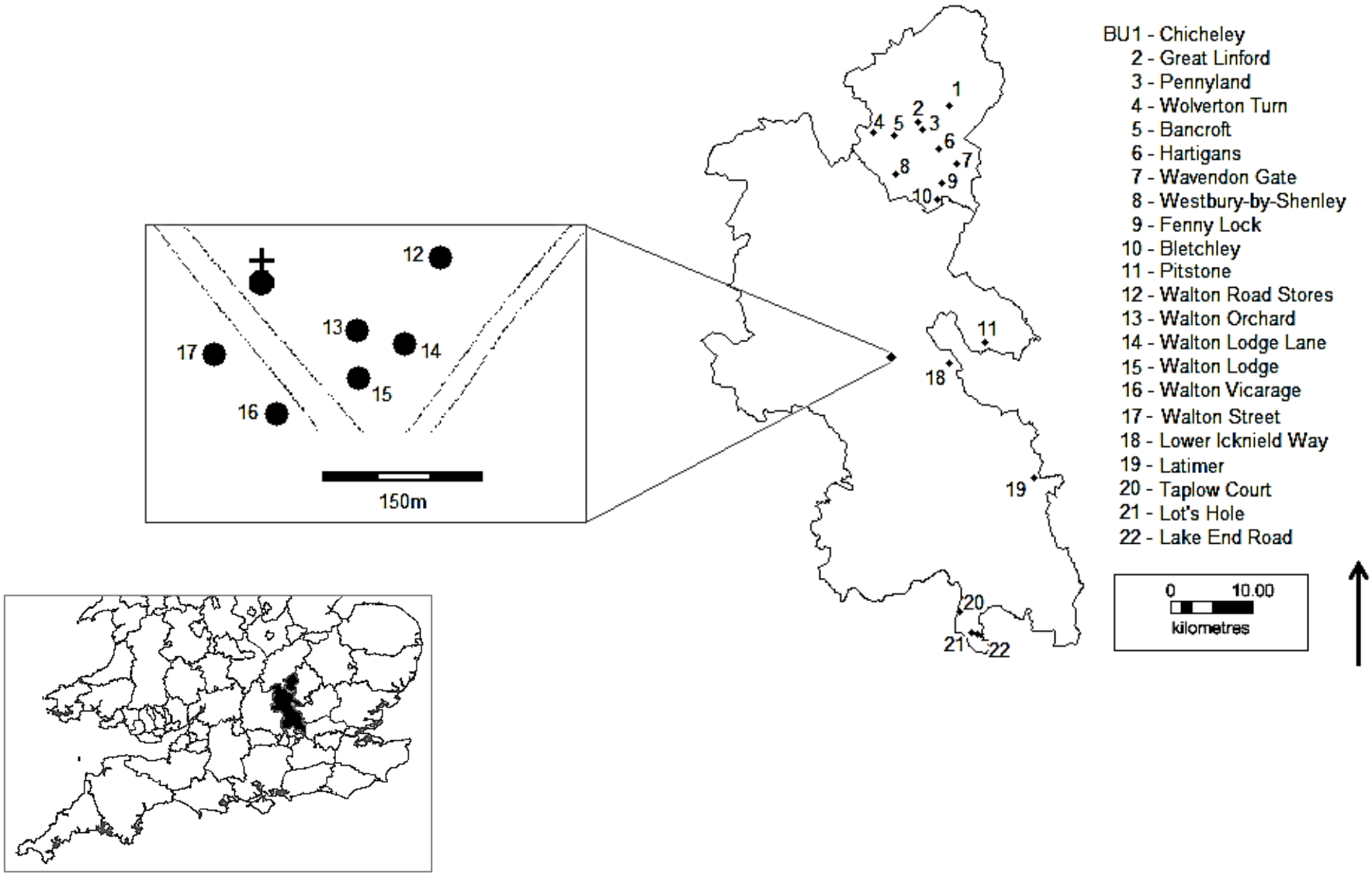
BE7:	**Hungerford** (Charnham Lane)
NGR:	SU 335 692
Main reference:	Ford 2002
Zooarchaeology:	J. Lovett
Archaeobotany:	W.J. Carruthers
Elevation:	100
Geology:	Floodplain and terrace of the Kennet: peat, clay, silt and gravel.
Summary:	Faunal remains from a pit and very sparse plant remains from a SFB; dated by sandy and organic-tempered potsherds to the Early/Mid Saxon period (6th-9th centuries).

BE8:	**Brimpton**
NGR:	SU 567 654
Main reference:	Lobb 1991
Zooarchaeology:	L. Cram
Archaeobotany:	n/a
Elevation:	60
Geology:	Bluff of river gravel near confluence of the Enborne and Kennet.
Summary:	Deposit from palaeochannel which may be of late 6th/7th c. or later date, since organic-tempered pottery (20 sherds) dominates the small ceramic assemblage. Contemporaneity of pottery and faunal assemblage is uncertain.

BE9:	**Old Windsor**
NGR:	SU 991 746
Main reference:	Wilson & Hurst 1958 pp.183–5
Zooarchaeology:	n/a
Archaeobotany:	n/a
Elevation:	17
Geology:	Floodplain gravel terrace of the Middle Thames.
Summary:	Remains of a triple vertical watermill and leat; dendrochronology suggests a probable construction date in the late 7th century.

BE10:	**Wraysbury** (Waylands Nursery)
NGR:	TQ 002 744
Main reference:	Pine 2003
Zooarchaeology:	S. Hamilton-Dyer
Archaeobotany:	n/a
Elevation:	17
Geology:	Gravel terrace of the Middle Thames overlain by a series of sand and silt deposits.
Summary:	Two pits and a SFB. Faunal assemblage derives mostly from SFB. The absence of organic-tempered wares in the ceramic assemblage would be consistent with a 5th-early 6th century chronology.

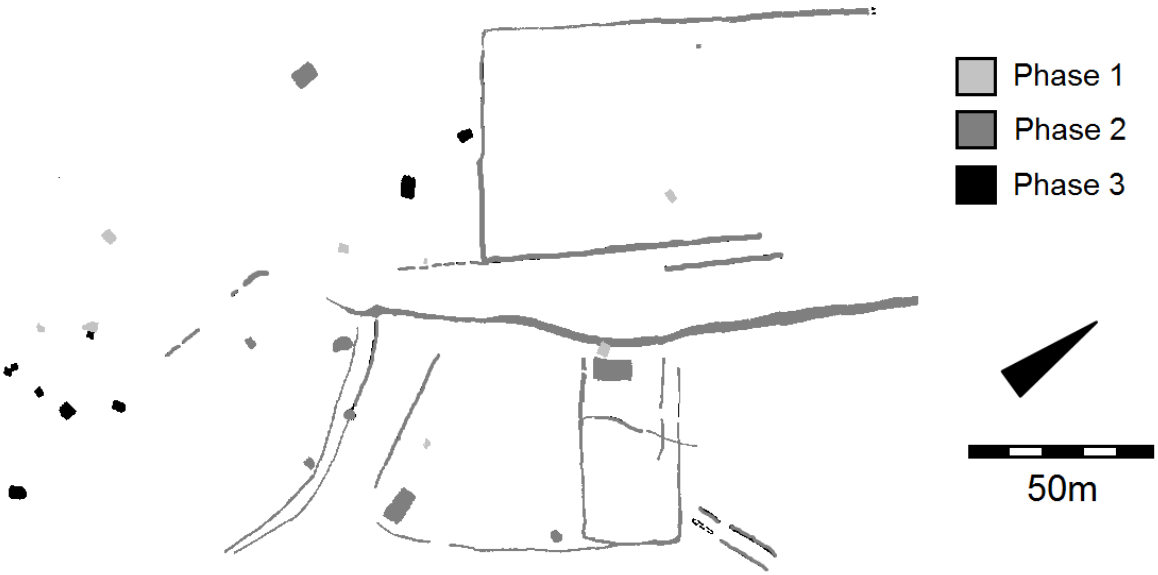
Buckinghamshire



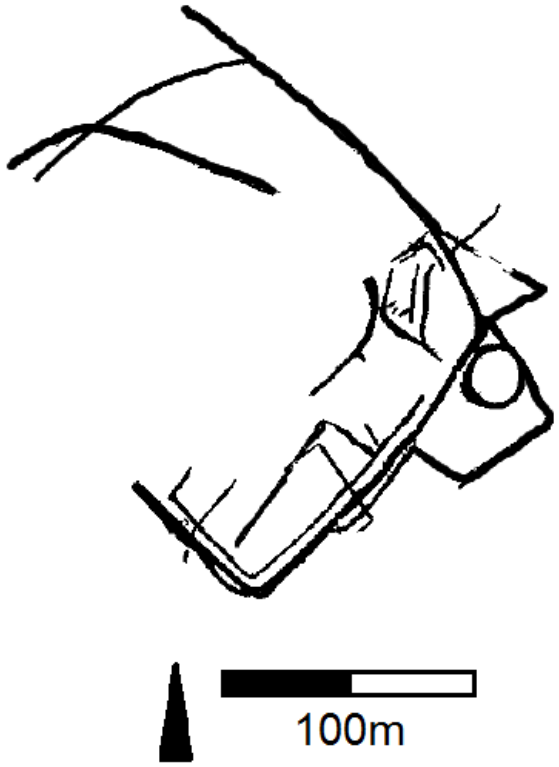
BU1:	**Chicheley**
NGR:	SP 89470 44070
Main reference:	Farley 1980
Zooarchaeology:	G. Jones
Archaeobotany:	n/a
Elevation:	60
Geology:	Oxford Clay.
Summary:	Ditch/gully; excavated portion containing Mid Saxon (7^{th}-9^{th} c.) Maxey-type ware potsherds and a small faunal assemblage.

BU2:	**Great Linford** (Church)
NGR:	SP 856 419
Main reference:	Mynard & Zeepvat 1992
Zooarchaeology:	J.M Holmes
Archaeobotany:	P. Busby
Elevation:	90
Geology:	Gravel terraces of the Ouse, Oxford Clay beds, and limestone outcrops in vicinity of site.
Summary:	Undisturbed buried soil underlying a medieval church, yielding Early and Mid Saxon sherds (including a sherd with incised decoration, and Maxey-type ware). Volume and condition of sherds suggests that the context represents activity across the Early and Mid Saxon periods. Small faunal and botanical assemblages both derive from this context.

BU3: **Pennyland**
NGR: SP 862 411
Main reference: Williams 1993
Zooarchaeology: J.M. Holmes
Archaeobotany: M. Jones
Elevation: 80
Geology: Gravel spur projecting from boulder clay ridge.
Summary: In the earliest phase, a scatter of SFBs and pits are dated to the Early Saxon period – in particular, perhaps, the 6th century – by the annular loomweights, an iron spearhead believed to be of 6th-7th century type, and the occurrence of stamped and incised decoration on potsherds. An Intermediate phase of occupation – consisting of SFBs, posthole buildings, ditched enclosures and droveways – lacks both decorated sherds and Ipswich Ware, but includes a bone comb of mid/late 6th c. type, and the site morphology would be consistent with a 7th century or later date. In the third phase, another scatter of SFBs, four small 'four-post structures', and a well are all dated to the Mid Saxon period by the presence of small amounts of Ipswich Ware (8th-9th c.) and a bone comb of late 7th–8th c. type.
Site plan: After Williams 1993, p.94, fig.52.



BU4: **Wolverton Turn**
NGR: SP 8025 4066
Main reference: Preston 2007
Zooarchaeology: N. Sykes
Archaeobotany: M Robinson & J. Letts
Elevation: 79
Geology: Mainly silty clay, with occasional outcropping limestone.
Summary: A large sub-rectangular enclosure. A ceramic assemblage including Ipswich Ware, plus bone C14-dated to cal.AD 690-890 (at 95% confidence), suggest that the enclosure ditches were associated with 8th-9th century activity. There is a circumstantial, stratigraphic case for assigning Kiln 418 to the Mid Saxon occupation represented by the enclosure ditches.
A SFB to the north contained bone C14-dated to cal.AD 430-600 (at 95%).
Site plan: After Preston 2007 p.85, fig.2.



BU5: **Bancroft**
NGR: SP 8273 4033
Main reference: Williams & Zeepvat 1994
Zooarchaeology: J. Holmes & K. Rielly
Archaeobotany: S. Nye & M. Jones
Elevation: 82
Geology: Ridge of boulder clay and glacial sand and gravel deposits.
Summary: One SFB of probable early/mid-5th century date (dated by a small plain hollow-necked biconical vessel), and a large boundary ditch aligned with early 5th century burials but of uncertain date.

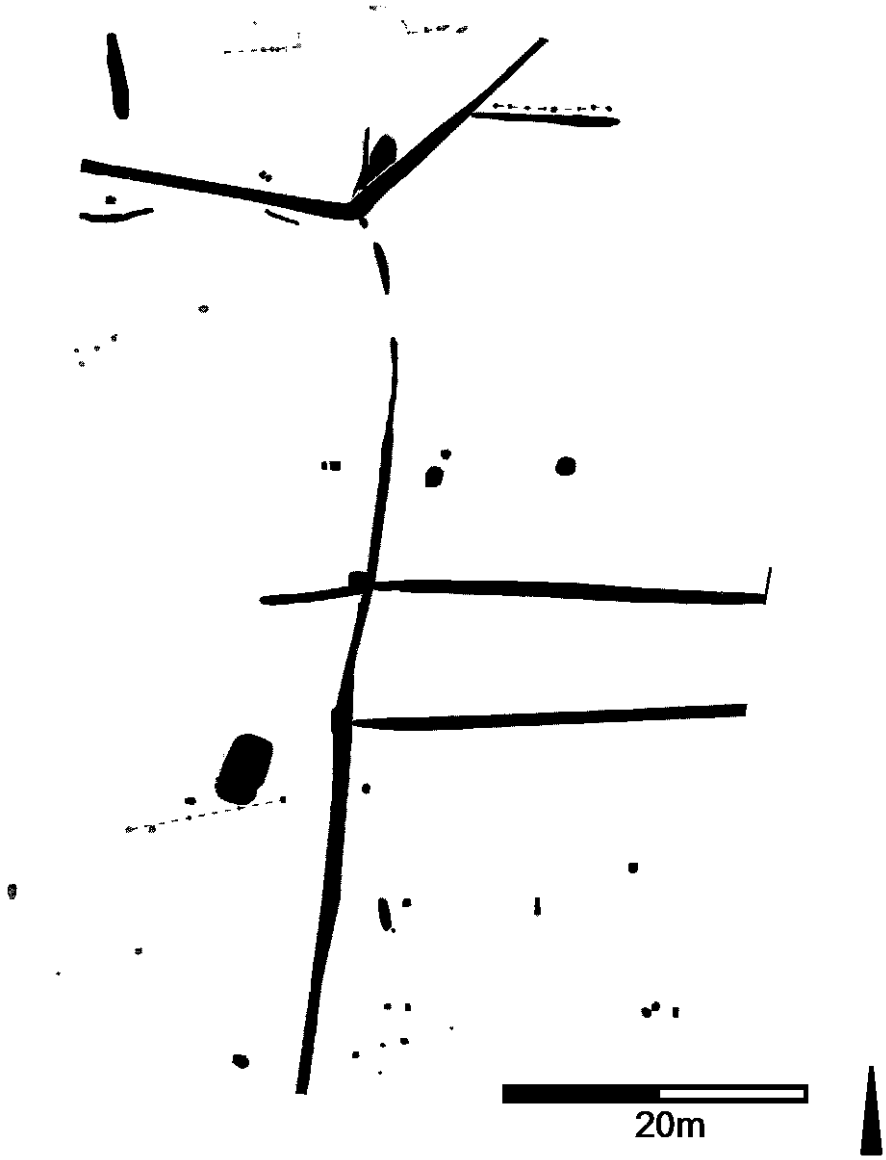
BU6: **Hartigans**
NGR: SP 882 387
Main reference: Williams 1993
Zooarchaeology: D. Burnett
Archaeobotany: J. Letts
Elevation: 66
Geology: Second gravel terrace of the eastern floodplain of the Ouzel.
Summary: Pits, a well and a SFB. Charcoal from the pits and wood from the well returned radiocarbon dates centring on the 5th-6th centuries.

BU7: **Wavendon Gate**
NGR: SP 903 369
Main reference: Williams *et al.* 1996
Zooarchaeology: K. Dobney & D. Jacques
Archaeobotany: J. Letts
Elevation: 88
Geology: Sand and gravel deposit upon a ridge of boulder clay.
Summary: Ephemeral Anglo-Saxon occupation on the site of a Roman settlement, comprising pits and postholes. The 6th century date favoured in the report is apparently based upon a single stamped sherd thought to be 6th century type, although the remainder of the ceramic assemblage (dominated by sandy fabrics, with a lower proportion of organic-tempered wares) would be consistent with this chronology.

BU8: **Westbury-by-Shenley**
NGR: SP 829 356
Main reference: Ivens *et al.* 1995
Zooarchaeology: n/a
Archaeobotany: J. Letts
Elevation: 110
Geology: Oxford Clay and boulder clay.
Summary: Two wells and a pit. Timber and a hazel hurdle from the wells returned radiocarbon dates spanning the mid-7th to mid-8th centuries.

BU9: **Fenny Lock**
NGR: SP 8845 3460
Main reference: Ford & Taylor 2001
Zooarchaeology: S. Hamilton-Dyer
Archaeobotany: n/a
Elevation: 80
Geology: Gravel terrace and alluvial floodplain of the Ouzel.
Summary: One or two SFBs, with faunal remains. The ceramic assemblage is said to include 'plain Saxon wares', not closely datable within the 5th-9th centuries.

BU10: **Bletchley** (Water Eaton)
NGR: SP 8805 3262
Main reference: Hancock 2006; 2010
Zooarchaeology: J. Rackham
Archaeobotany: G. Martin
Elevation: 75
Geology: Gravel terraces of the Ouzel.
Summary: One SFB, pits, ditched enclosures and a trackway are dated to the Mid Saxon period (7th-9th c.) by the occurrence, within a small ceramic assemblage, of one sherd of Ipswich Ware sherd and eight of Maxey-type ware.
Site plan: After Hancock 2010 p.10, fig.4.



BU11:	**Pitstone**
NGR:	SP 9382 1507
Main reference:	Phillips 2005
Zooarchaeology:	E. Hambleton
Archaeobotany:	J. Robinson
Elevation:	120
Geology:	At foot of Chilterns scarp; chalky head deposits above Lower Chalk bedrock.
Summary:	SFBs and pits, plus refuse in the upper fill of a Roman ditch. The pottery is mostly sand-tempered and undecorated, generally consistent with a 5th-6th century date.

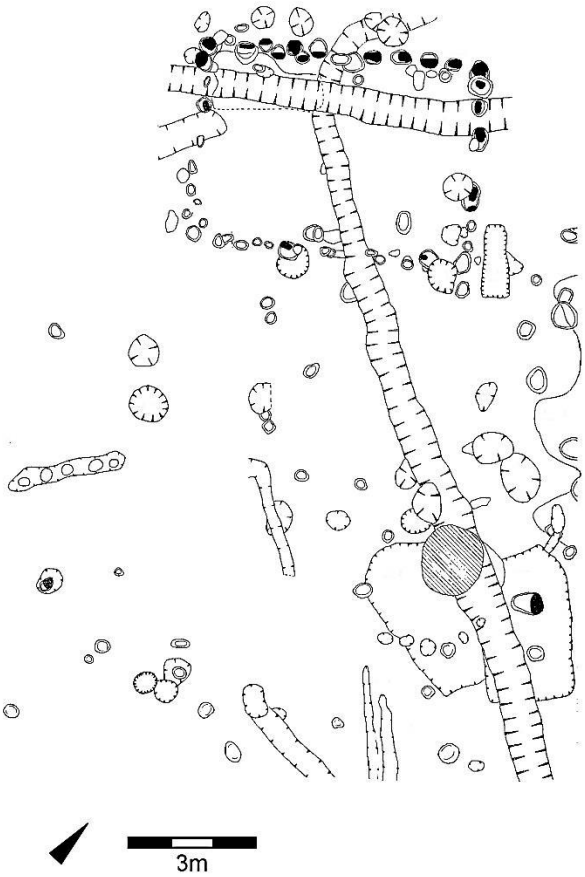
BU12:	**Walton Road Stores**
NGR:	SP 8245 1335
Main reference:	Bonner 1997
Zooarchaeology:	P. Sadler 1998
Archaeobotany:	M. Robinson 1997
Elevation:	85
Geology:	Degraded clayey limestone with patches of sand.
Summary:	(With BU14) 7 SFBs, two possible post-built structures, gullies, pits and fence lines. Available typescripts were in an unfinished state, but suggest that the distribution of different ceramic fabrics reveals a division in the SFBS, between those of 5th-6th c. (371, 633, 2333 and 3253) and those of 7th-8th c. date (368, 2016, and 2290). In the absence of a more detailed analysis, the present author errs on the side of caution, and treats the whole site generically as of 'Early/Mid Saxon' date.

BU13: **Walton Orchard**
NGR: SP 8238 1328
Main reference: Ford & Howell 2004
Zooarchaeology: S. Hamilton-Dyer
Archaeobotany: J. Letts
Elevation: 84
Geology: Portland Beds, of soft limestone and sands.
Summary: Eight posthole buildings, one beamslot building, one SFB, fences, pits, gullies and hearths representing several phases of Anglo-Saxon activity. The ceramic assemblage includes two stamped sherds, two sherds of possible Ipswich Ware, and three of possible Maxey-type ware. The sparseness and likely residuality or redeposition of much of the pottery – and associated faunal and botanical material – precludes any closer chronological definition at this site. However, the axial arrangement of the buildings and beamslot construction of one of them might suggest that activity occurred in the 7th century or later.
Site plan: After Ford & Howell 2004, p.62, fig.3.2.

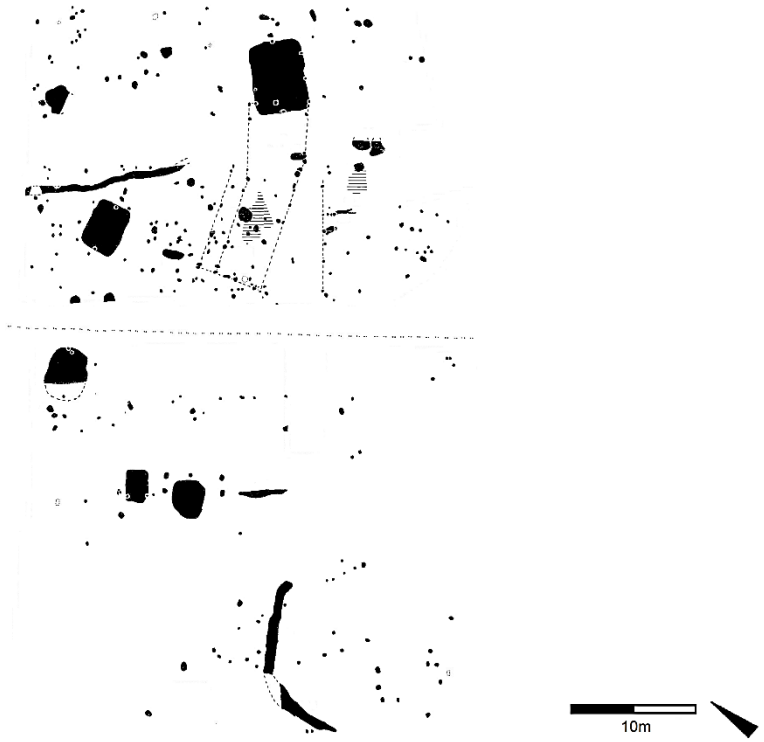


BU14: **Walton Lodge Lane**
NGR: SP 8242 1327
Main reference: Bonner 1997
Zooarchaeology: P. Sadler 1998
Archaeobotany: n/a
Elevation: 85
Geology: Degraded clayey limestone with patches of sand.
Summary: See BU12.

BU15: **Walton Lodge**
NGR: SP 8238 1324
Main reference: Dalwood *et al.* 1989
Zooarchaeology: P. Sadler
Archaeobotany: J. Giorgi
Elevation: 84
Geology: Portland Beds, of soft limestone and sands.
Summary: Post-built structures, postholes, gullies, small pits and layers. A single sherd of Ipswich Ware suggests occupation in or by the early 8th century.
Site plan: After Dalwood *et al.* 1989, p.146, fig.5.

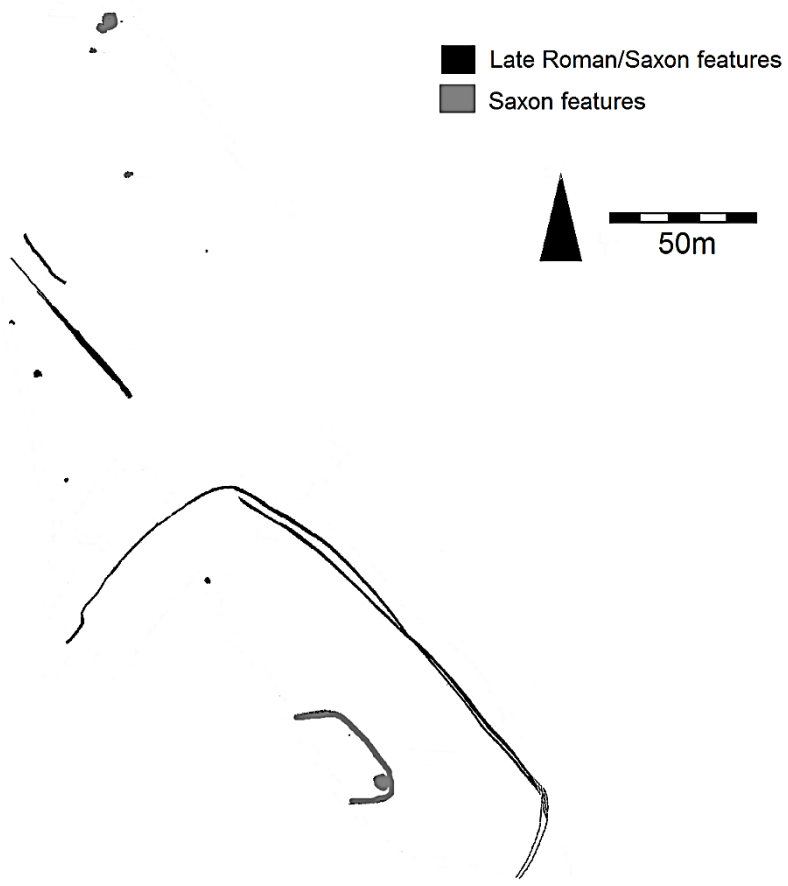


BU16: **Walton Vicarage**
NGR: SP 822 132
Main reference: Farley 1976
Zooarchaeology: B. Noddle
Archaeobotany: M. Monk
Elevation: 84
Geology: Portland Beds, of soft limestone and sands.
Summary: Five SFBs, three post-built structures, gullies and pits; occupation does not appear to be closely datable within the Early/Mid Saxon period, on available evidence.
Site plan: After Farley 1976, p.177, fig.4.



BU17: **Walton Street** (82-84 Walton St, Aylesbury)
NGR: SP 8225 1325
Main reference: Stone 2009; 2011
Zooarchaeology: J. Morris
Archaeobotany: A. Livarda
Elevation: 80
Geology: Portland Beds, of soft limestone and sands.
Summary: Pits and gullies. Ceramic assemblage thought consistent with a late 6th to 8th century date (single Ipswich Ware sherd; organic-tempered fabrics well-represented).

BU18:	**Lower Icknield Way**
NGR:	SP 893 126
Main reference:	Masefield 2008
Zooarchaeology:	L. Sibun
Archaeobotany:	R. Scaife
Elevation:	108
Geology:	Gault Clay of the Vale of Aylesbury; chalk formations immediately to the south.
Summary:	Pits (and possibly an enclosure ditch), dated by a ceramic assemblage with a high proportion of organic-tempered sherds, consistent with a 7th century (or later) date.
Site plan:	After Masefield 2008, p.58, fig.36.



BU19:	**Latimer**
NGR:	SU 998 986
Main reference:	Branigan 1971
Zooarchaeology:	R. Hamilton
Archaeobotany:	n/a
Elevation:	95
Geology:	In Chess Valley running from Chilterns dipslope: clay-with-flints, glacial gravels, and alluvium.
Summary:	Imperfectly understood "Sub-Roman" phase at villa.

BU20:	**Taplow Court**
NGR:	SU 907 823
Main reference:	Allen *et al.* 2009
Zooarchaeology:	E.-J. Evans
Archaeobotany:	M. Robinson
Elevation:	65
Geology:	Black Park terrace gravel over Upper Chalk.
Summary:	Reoccupation of Iron Age hillfort, represented by domestic debris in surrounding ditches; charred cereal remains were C14-dated to cal.AD 770-980 and 670-780 (at 95% confidence). 7th-9th century radiocarbon dates also obtained from charcoal in postholes.

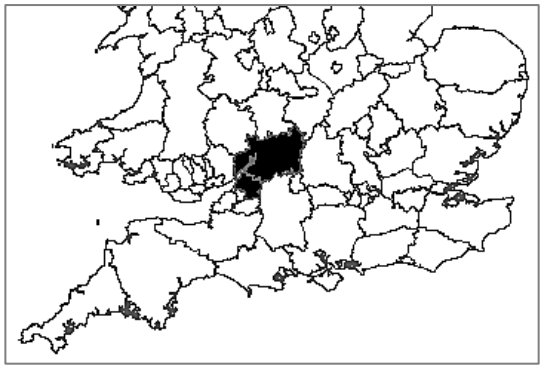
BU21:	**Lot's Hole** (Dorney)
NGR:	SU 9220 7970
Main reference:	Foreman *et al.* 2002
Zooarchaeology:	A. Powell & K. Clark
Archaeobotany:	R. Pelling
Elevation:	23
Geology:	First terrace gravels, within a system of palaeochannels (largely silted up).
Summary:	Pits, whose fills are dated by the presence of Ipswich Ware, North French Ware, Tating Ware, and 7th-10th c. radiocarbon dates to the Mid Saxon period – perhaps centring specifically on the mid-8th century. Adjacent to **BU22**.

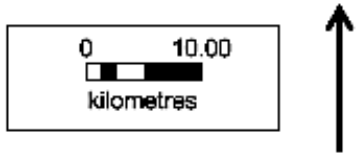
BU22:	**Lake End Road** (Dorney)
NGR:	SU 9294 7960
Main reference:	Foreman *et al.* 2002
Zooarchaeology:	A. Powell & K. Clark
Archaeobotany:	R. Pelling
Elevation:	22
Geology:	First terrace gravels, within a system of palaeochannels (largely silted up).
Summary:	Pits, whose fills are dated by the presence of Ipswich Ware, North French Ware, Tating Ware, and 7th-10th c. radiocarbon dates to the Mid Saxon period – perhaps centring specifically on the mid-8th century. However, charred grain from one pit was C14-dated to cal.AD 430-660, despite the occurrence of 8th c. pottery in the same context. Two adjacent sites, Lake End Road East and West; both adjacent to **BU21**.

Gloucestershire



GL1 - Dumbleton
2 - Bishop's Cleeve
3 - Lower Slaughter
4 - Barnsley Park
5 - Frocester Court
6 - Uley
7 - Lechlade

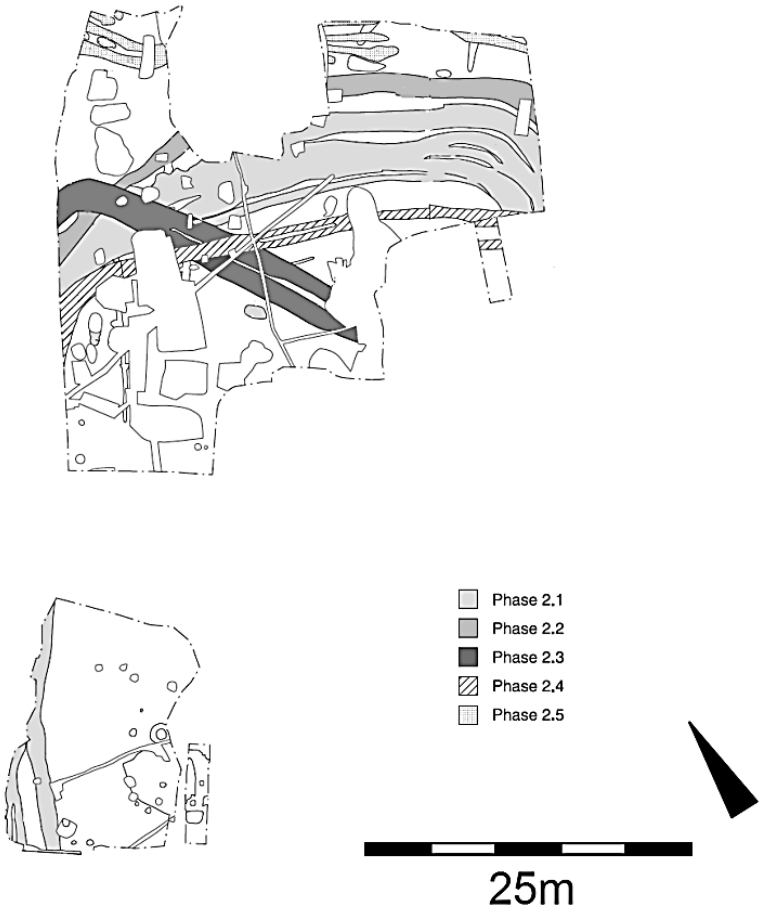




GL1:	**Dumbleton** (Bank Farm)
NGR:	SP 0272 3658
Main reference:	Coleman *et al.* 2006
Zooarchaeology:	n/a
Archaeobotany:	W.J. Carruthers
Elevation:	60
Geology:	Thin gravel layer (probable a remnant of second terrace of the Avon) overlying clay.
Summary:	Ditch fills yielding generic Early/Mid Saxon pottery (5th-9th centuries), and one associated botanical sample. However, charred plant remains in other samples – considered to be of prehistoric date – returned radiocarbon dates spanning the 6th to 10th centuries.

GL2:	**Bishop's Cleeve** (Church Road)
NGR:	SO 95855 27560
Main reference:	Lovell *et al.* 2007
Zooarchaeology:	A. Powell & S. Knight
Archaeobotany:	R. Pelling
Elevation:	56
Geology:	Below Cleeve Hill (highest point in Cotswolds), on deposit of Cheltenham Sand.
Summary:	Ditches, pits, posthole and channel fill dated to the Early/Mid Saxon period by handmade pottery in various fabrics; a relatively high proportion of organic-tempered wares in the assemblage might support a chronology centred on the 7th century or later.

GL3: **Lower Slaughter** (Copsehill Road)
NGR: SP 1650 2267
Main reference: Kenyon & Watts 2006
Zooarchaeology: E. Hambleton
Archaeobotany: J. Jones
Elevation: 138
Geology: Gravel terrace to north of the Slaughter Brook.
Summary: Sequence of shallow ditches containing Late Roman and Anglo-Saxon pottery, plus bone with C14 dates converging on cal.AD 660-900 (at 88-95% confidence).
Site plan: After Kenyon & Watts 2006, p.83, fig.6.

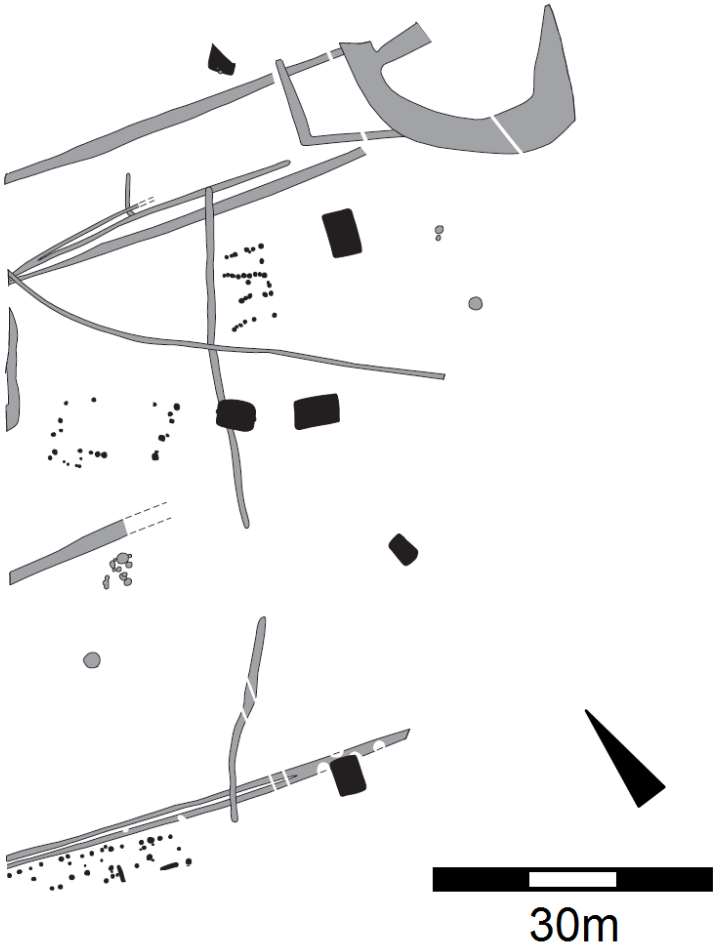


GL4: **Barnsley Park**
NGR: SP 083 067
Main reference: Webster *et al.* 1985
Zooarchaeology: B. Noddle
Archaeobotany: n/a
Elevation: 140
Geology: Cotswold limestone overlain in places with boulder clay.
Summary: Imperfectly understood “Sub-Roman” phase at villa site.

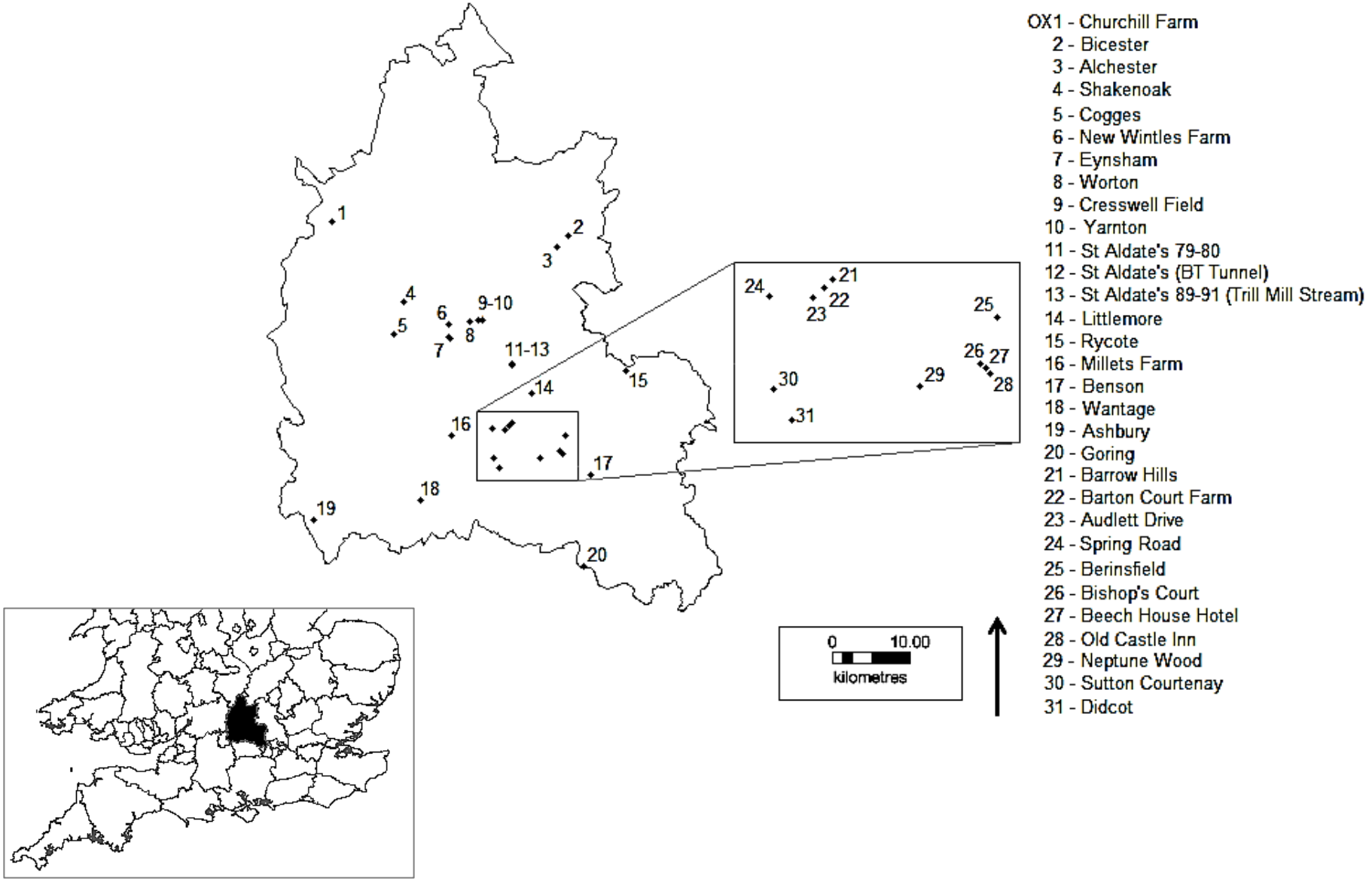
GL5: **Frocester Court**
NGR: SO 785 032
Main reference: Price 2000
Zooarchaeology: B. Noddle
Archaeobotany: n/a
Elevation: 40
Geology: Third gravel terrace of the Severn, overlying clay.
Summary: Imperfectly understood "Sub-Roman" or post-Roman phase at a villa site. A phase which included an ox skull C14-dated to cal.AD 534-632 was followed by occupation represented by organic-tempered pottery.

GL6: **Uley** (West Hill)
NGR: ST 789 997
Main reference: Woodward & Leach 1993
Zooarchaeology: B. Levitan
Archaeobotany: n/a
Elevation: 246
Geology: Spur of Cotswolds escarpment, bearing thin soils.
Summary: Post-Roman sequence (Phase 7) at a Romano-British shrine, including possible ecclesiastical structures and a faunal assemblage. Dated by handmade Anglo-Saxon pottery in limestone and organic-tempered fabrics, but it is unclear as to how the sub-phases were assigned respectively to the 5th, 6th and 7th centuries. The zooarchaeological data are not sub-phased.

GL7: **Lechlade** (Sherborne House)
NGR: SU 2126 9974
Main reference: Bateman *et al.* 2003
Zooarchaeology: M. Maltby
Archaeobotany: C. Stevens
Elevation: 77
Geology: Second terrace gravels of Upper Thames.
Summary: Six SFBs, three post-built structures, ditched enclosures and a possible trackway. On morphological grounds, the sequence of successive ditched features is likely to date from the 7th century or later; the high proportion of organic-tempered sherds in the ceramic assemblage would also be consistent with such a chronology. The faunal assemblage derives almost exclusively from the SFBs; four botanical samples all derive from the same SFB.
Site plan: After Bateman *et al*. 2003, p.41, fig.12.



Oxfordshire



OX1 - Churchill Farm
2 - Bicester
3 - Alchester
4 - Shakenoak
5 - Cogges
6 - New Wintles Farm
7 - Eynsham
8 - Worton
9 - Cresswell Field
10 - Yarnton
11 - St Aldate's 79-80
12 - St Aldate's (BT Tunnel)
13 - St Aldate's 89-91 (Trill Mill Stream)
14 - Littlemore
15 - Rycote
16 - Millets Farm
17 - Benson
18 - Wantage
19 - Ashbury
20 - Goring
21 - Barrow Hills
22 - Barton Court Farm
23 - Audlett Drive
24 - Spring Road
25 - Berinsfield
26 - Bishop's Court
27 - Beech House Hotel
28 - Old Castle Inn
29 - Neptune Wood
30 - Sutton Courtenay
31 - Didcot

OX1: **Churchill Farm** (Kingham Road, Churchill)
NGR: SP 2815 2420
Main reference: Hindmarch 2002
Zooarchaeology: S. Anthony
Archaeobotany: n/a
Elevation: 163
Geology: Cotswold limestone.
Summary: A possible SFB with associated postholes/stakeholes; small faunal assemblage retrieved from the fill along with three Roman potsherds and one large gravel-tempered sherd from a long-necked shouldered jar: dated by the analyst to the 7th century but without supporting references.

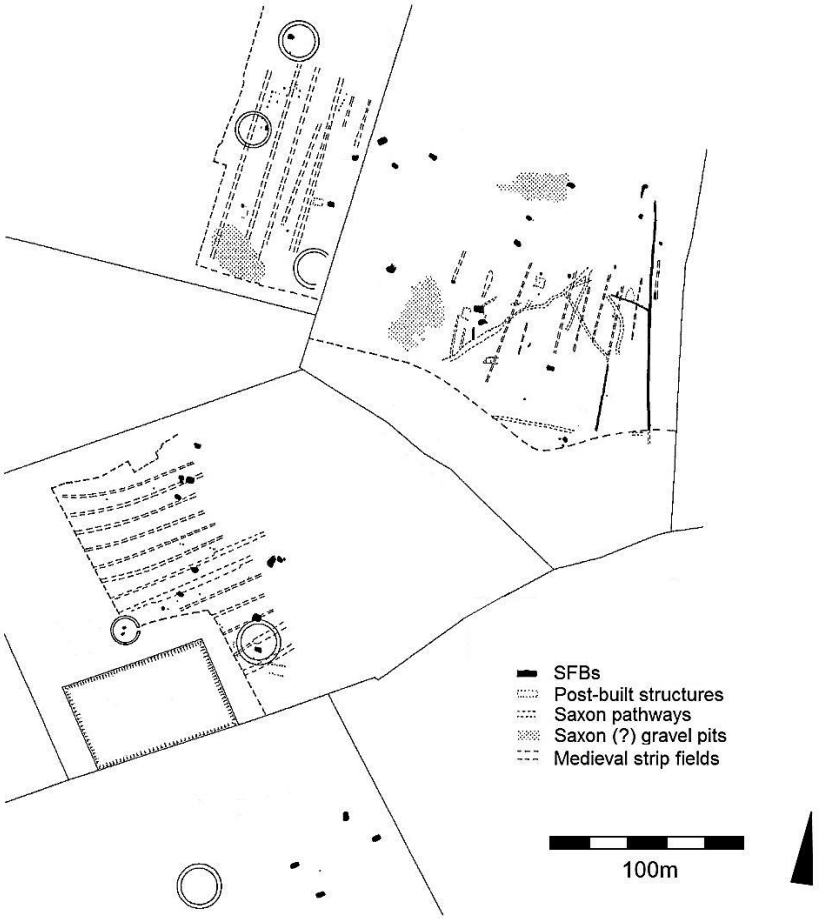
OX2: **Bicester** (Chapel Street)
NGR: SP 5855 2225
Main reference: Harding & Andrews 2003
Zooarchaeology: P. Smith
Archaeobotany: n/a
Elevation: 70
Geology: Where limestone of Cotswold dipslope meets Oxford Clay and river gravels, near banks of the Bure.
Summary: Three SFBs, two ditches, two pits, and some postholes; a chronology centred on the 6th century is suggested by the ceramic assemblage, which includes a "swallow's nest" lug handle, stamped decoration, and a relatively low proportion of organic-tempered sherds.

OX3: **Alchester** (extramural)
NGR: SP 5715 2095
Main reference: Booth *et al.* 2001
Zooarchaeology: n/a
Archaeobotany: R. Pelling
Elevation: 65
Geology: Clays and gravels in Upper Thames valley.
Summary: Anglo-Saxon pottery in layers overlying Romano-British features; a botanical sample is thus given a Saxon date. Burnt stone in the Saxon layers provides a circumstantial case for the survival of a Roman grain oven into the post-Roman period. There is little dating evidence, although a stamped sherd, lack of organic-tempered fabrics, and stratigraphic circumstances may favour a 5th-6th century chronology.

OX4:	**Shakenoak**
NGR:	SP 374 138
Main reference:	Brodribb *et al.* 2005
Zooarchaeology:	Brodribb *et al*.
Archaeobotany:	n/a
Elevation:	109
Geology:	Cotswold limestone, near junction with clays and river gravels of Upper Thames valley.
Summary:	Poorly-understood post-Roman occupation at a villa site, represented by artefactual and faunal material in the fill of a boundary ditch; originally dated to the 7th and possibly 8th centuries, the assemblage is here provisionally classified as “Sub-Roman”.

OX5:	**Cogges** (Cogges Manor Farm, Witney)
NGR:	SP 3621 0963
Main reference:	Rowley & Steiner 1996
Zooarchaeology:	n/a
Archaeobotany:	M. Robinson
Elevation:	81
Geology:	Raised above Windrush floodplain on outcrop of Cornbrash formation limestone.
Summary:	Pits, postholes and one SFB may be dated to the 5th-6th centuries, by the occurrence of stamped and incised decoration on sherds, of mostly calcareous fabrics. Botanical samples (“presence” data) derive from the fills of the postholes and the SFB.

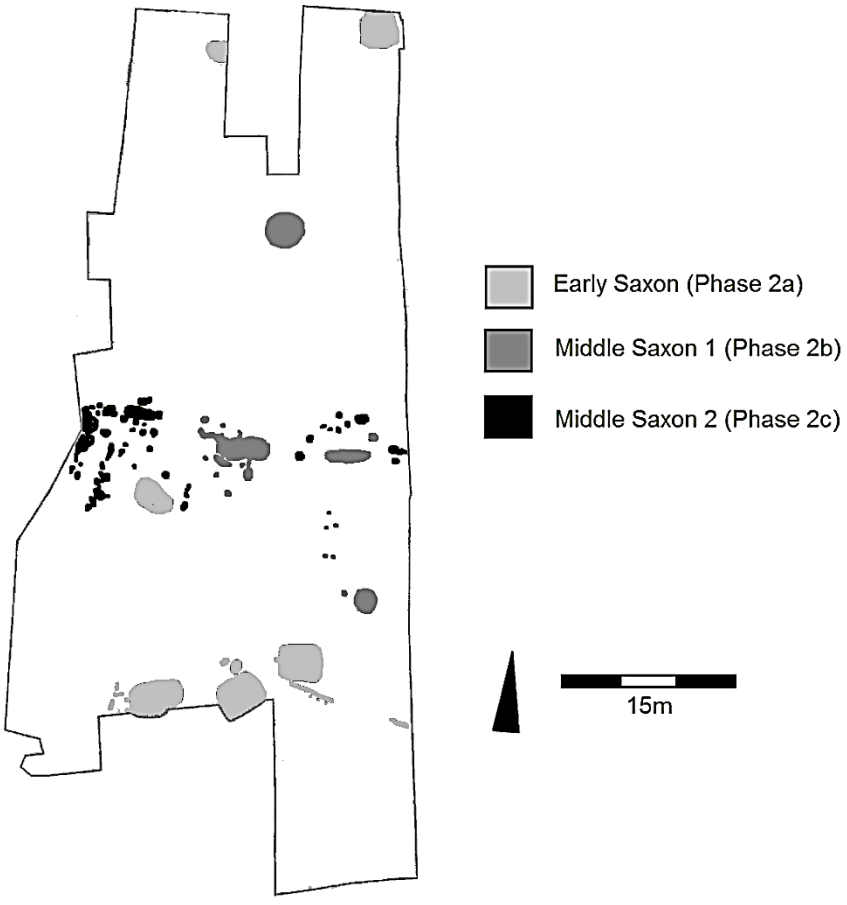
OX6: **New Wintles Farm** (nr. Eynsham)
NGR: SP 432 108
Main reference: Gray 1974
Zooarchaeology: Noddle 1975
Archaeobotany: n/a
Elevation: 64
Geology: Gravel terrace in Upper Thames valley.
Summary: SFBs, post-built structures, pits and fence lines, representing at least two stages of settlement at this largely unpublished site. A group of features to the south is dated to the 6th century, and another to the north is dated to between the 7th and (at least) early 8th centuries. Dating evidence includes an 8th-century metal object, and Freda Berisford's interpretation of the ceramic assemblage.
Site plan: After Booth *et al.* 2007, p.108, fig.3.32.



OX7: **Eynsham** (Abbey)
NGR: SP 433 091
Main reference: Hardy *et al.* 2003
Zooarchaeology: J. Mulville
Archaeobotany: R. Pelling
Elevation: 66
Geology: Calcareous gravel terrace, overlying Oxford Clay, at confluence of Evenlode and Thames.

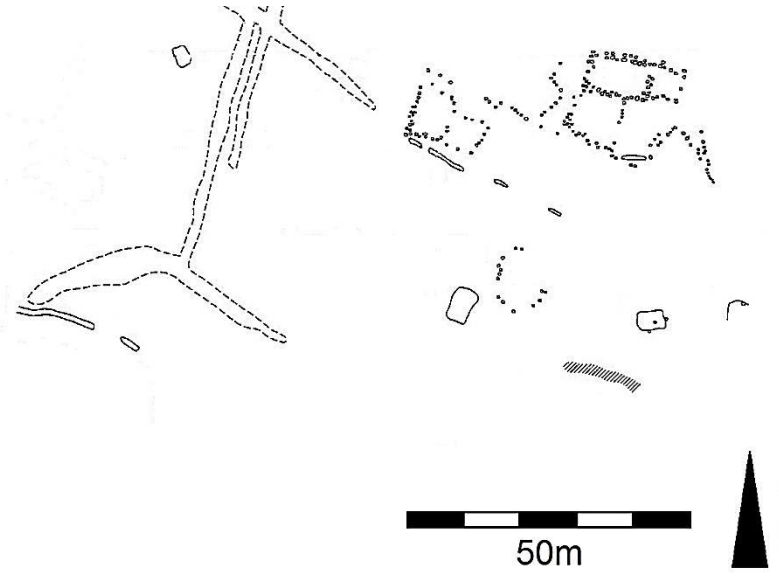
Summary: Early Saxon occupation (Phase 2a) is represented by five or six SFBs, plus a pit, fence line, and postholes; the occurrence of incised and especially stamped decoration on sherds is cited in support of a predominantly 6th century date. Mid Saxon occupation (2b) is initially represented by pits, burnt areas, hearths and associated postholes and beamslots; apart from its stratigraphic relationship to Phases 2a and 2c, this phase is dated by two early 8th century *sceattas* found in the large pit 394, to the north of the trench. Later Mid Saxon occupation (2c) is represented two probable post-hole buildings, an alignment of pits, and boundary ditches. Small amounts of Late Saxon pottery, and an early/mid-9th century Northumbrian *styca* suggest a terminal date in the latter part of the 9th century.
Although the stratigraphic relationships between Phases 2b and 2c features are not all clearly understood, the excavators suggest that the phases may span the mid-7th to early/mid-8th centuries, and the early/mid-8th to the late 9th centuries respectively.

Site plan: After Hardy *et al.* 2003, p.26-27, fig.2.1-2.2.

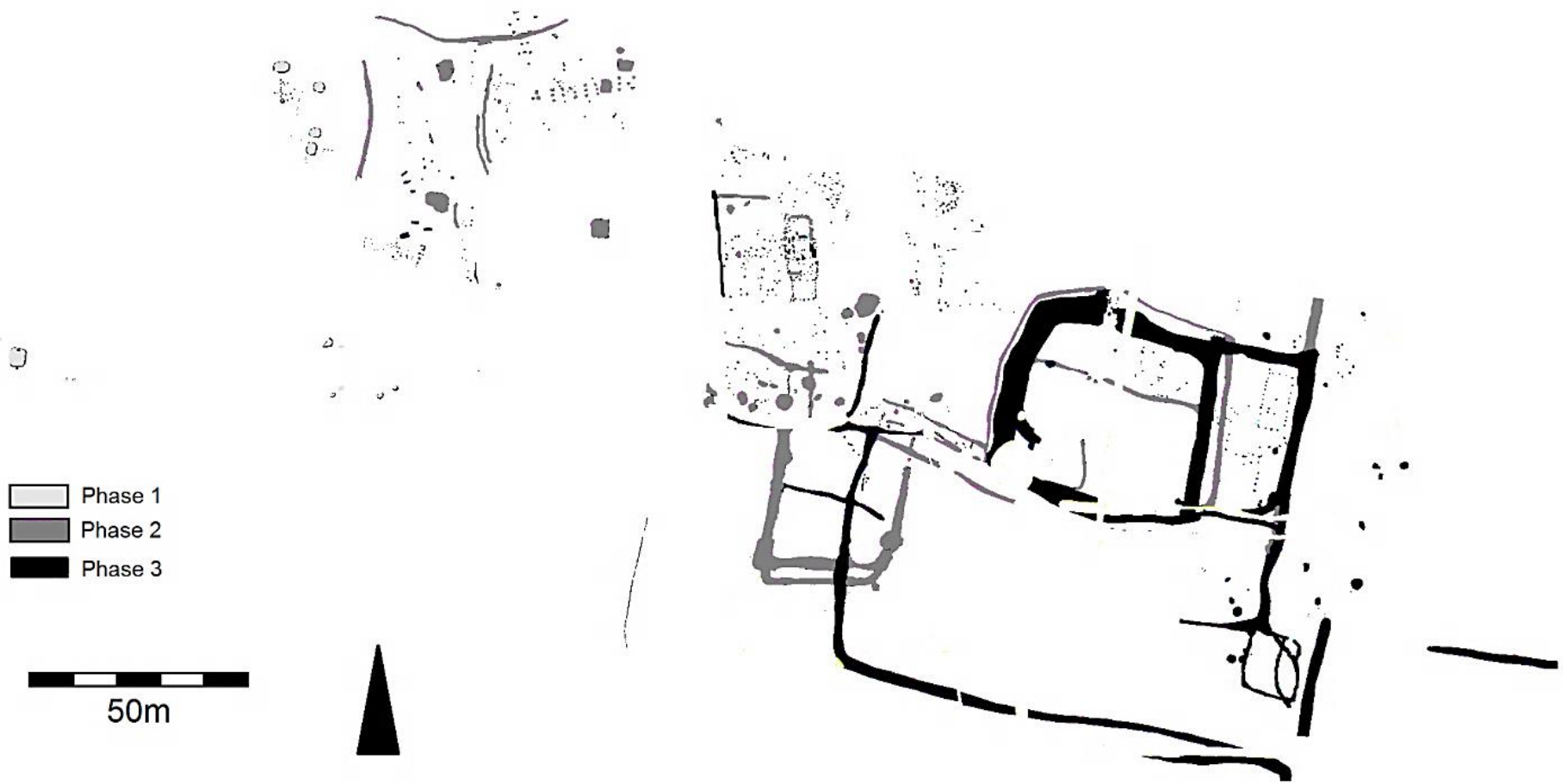


OX8: **Worton**
NGR: SP 460 112
Main reference: Hey 2004
Zooarchaeology: J. Mulville & K. Ayres
Archaeobotany: M. Robinson
Elevation: 64
Geology: Second gravel terrace of the Upper Thames.
Summary: Three SFBs, a posthole and possible pit are assigned to an Early Saxon phase, whose ceramic assemblage – dominated by organic-tempered sherds and including stamped decoration – may suggest a late 6th-7th century date. A subsequent Mid Saxon phase is represented by a post-in-trench building; charred grain from a post-pipe in a wall-trench was C14-dated to cal.AD 640-880 (at 95% confidence).

OX9: **Cresswell Field**
NGR: SP 470 114
Main reference: Hey 2004
Zooarchaeology: J. Mulville & K. Ayres
Archaeobotany: R. Pelling
Elevation: 62
Geology: Second gravel terrace of the Upper Thames.
Summary: Rectangular post-built structure, fenced enclosures, and at least three SFBs. A bone comb from the post-built structure was C14-dated to cal.AD 640-810 (at 95% confidence); cereal grains and charcoal from other postholes were C14-dated to cal.AD 770-1010, 660-890, and 660-900 respectively; the structure is thus believed to be of 8th-9th century date. One of the SFBs appears to represent earlier activity: a cattle skull from SFB 7395 was C14-dated to cal.AD 410-650 and 540-680. SFB 7325, however, was perhaps contemporary with the post-built structure (bone in backfill dated to cal.AD 640-860 and 530-680).
Site plan: After Hey 2004, p.179, fig.9.2.



OX10:	**Yarnton**
NGR:	SP 475 113
Main reference:	Hey 2004
Zooarchaeology:	J. Mulville & K. Ayres
Archaeobotany:	C. Stevens & M. Robinson
Elevation:	62
Geology:	Second gravel terrace of the Upper Thames.
Summary:	Complex settlement sequence at a multi-phase site, with chronological difficulties compounded by a lack of diagnostic ceramics. Stratigraphic relationships, and an extensive C14-dating programme, suggest the following phasing (some of which is, nonetheless, circumstantial). Four SFBs and a small post-built structure belong to an Early Saxon phase, from the late 5th or early 6th century; a larger SFB (430) with a pit and postholes is probably 7th century in date. From the late 7th or early 8th century, the character of the settlement was transformed: post-built structures, SFBs, ditched enclosures, paddocks and a possible trackway, pits, fence lines, and specialist buildings interpreted as granaries and a 'fowl house' were constructed. In the later 8th and 9th centuries, the ditches were recut on a larger, deeper scale; new post-built structures were created or rebuilt, and further pits/wells were dug.
Site plan:	After Hey 2004, p.20, fig.1.5.

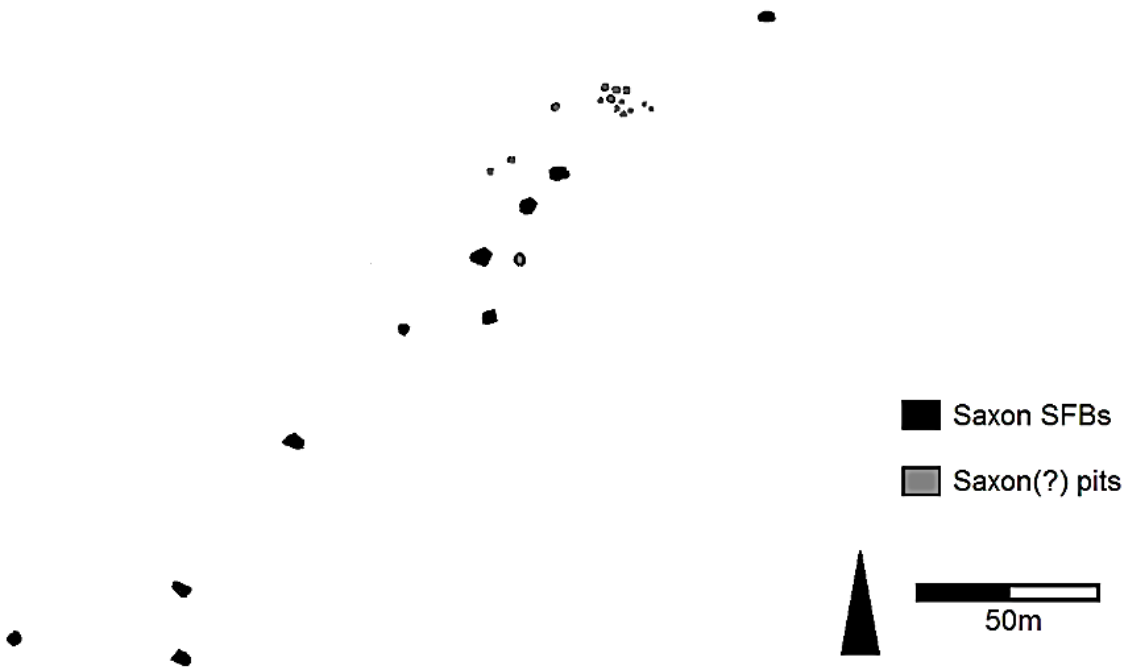

Phase 1
Phase 2
Phase 3
50m

OX11: **St Aldate's 79-80**
NGR: SP 51400 05825
Main reference: Durham 1977
Zooarchaeology: B.J. Marples
Archaeobotany: n/a
Elevation: 57
Geology: Seasonally flooded islands of alluvial clay on Thames floodplain.
Summary: Complex sequence including revetments and a clay bank which may represent a causeway; thermoluminescence dating of pottery from this phase returned a date range of AD 631-779.

OX12: **St Aldate's – BT Tunnel**
NGR: SP 51430 05645
Main reference: Dodd 2003
Zooarchaeology: n/a
Archaeobotany: M. Robinson
Elevation: 53
Geology: Seasonally flooded islands of alluvial clay on Thames floodplain.
Summary: Cobbled surface, possibly of Early Saxon date, whose dating is based upon Robinson's palaeoenvironmental sequence for the development of the floodplain, and also upon the felling date (AD 577-619) of a plank found in the overlying silt. A putative bridge trestle was C14-dated to cal AD 660-900 (at 95% confidence).

OX13: **St Aldate's 89-91** (Trill Mill Stream)
NGR: SP 51365 05910
Main reference: Dodd 2003
Zooarchaeology: B. Wilson
Archaeobotany: M. Robinson
Elevation: 53
Geology: Seasonally flooded islands of alluvial clay on Thames floodplain.
Summary: Wattle revetments C14-dated to cal.AD 660-990, and 680-1020; the phase is succeeded by a Late Saxon phase dated to the 10th century by pottery and C14 dates.

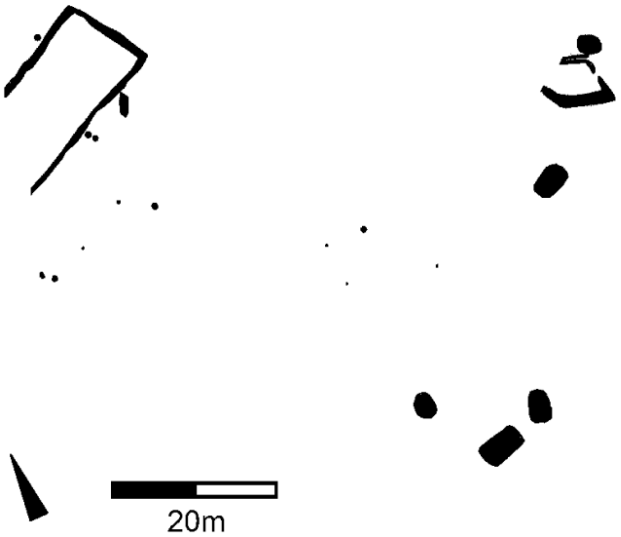
OX14: **Littlemore** (Oxford Science Park)
NGR: SP 5390 0210
Main reference: Moore 2001
Zooarchaeology: C. Ingrem
Archaeobotany: R. Pelling
Elevation: 63
Geology: Sands and sandy clays of the Corallian limestone ridge, with alluvium along the nearby Littlemore Brook.
Summary: A string of at least 10 SFBs, over 265m; dated to the 6th and possibly 7th centuries by the ceramic assemblage: handmade 'Early/Mid Saxon' pottery including some organic-tempered sherds, and 24 sherds bearing stamped/incised decoration. Some pits may also be Anglo-Saxon in date, but their fills are less securely dated. The vast majority of Anglo-Saxon animal bones and plant remains derive from the SFBs.
Site plan: After Moore 2001, p.169, fig.3.



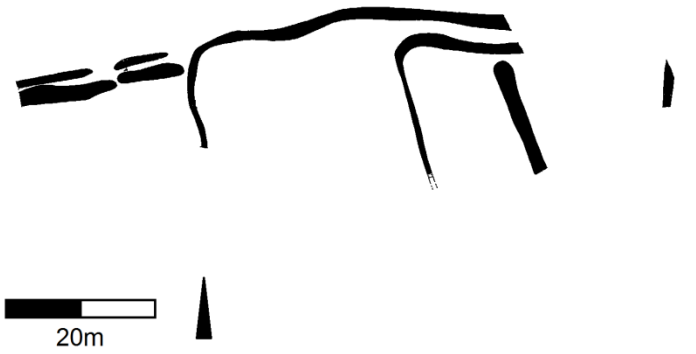
OX15: **Rycote** (Site 30)
NGR: SP 6609 0495
Main reference: Taylor & Ford 2004
Zooarchaeology: S. Hamilton-Dyer
Archaeobotany: M. Robinson
Elevation: 85
Geology: Lower Greensand and gravel.
Summary: Two SFBs, four parallel ditches, five pits and two postholes are thought to represent at least two sub-phases of Anglo-Saxon activity. The fill of SFB 1014 contained a ceramic assemblage dominated by sandy wares, some sherds bearing incised and/or stamped decoration; a bone was C14-dated to cal. AD 437-637 at 95% probability. The fill of SFB 1011, which cut one of the ditches, contained a ceramic assemblage dominated by organic-tempered sherds, none of which were decorated; a tooth was C14-dated to cal.AD 646-758 at 95% confidence. The other features are less closely datable; hence, a single botanical sample and some of the (very few) animal bones are not closely datable within the Early/Mid Saxon period.

OX16: **Millets Farm** (Frilford)
NGR: SU 4349 9654
Main reference: Cass & Ford 2008
Zooarchaeology: C. Falys
Archaeobotany: n/a
Elevation: 63
Geology: Sands and sandy clays of the Corallian limestone ridge.
Summary: Ditches, pits and a possible SFB, broadly dated by a 6th-9th century ceramic assemblage consisting mostly of sandy or organic-tempered fabrics, with no decorated sherds; features also produced faunal assemblage.

OX17: **Benson** (St Helen's Avenue)
NGR: SU 61590 91550
Main reference: Pine & Ford 2003
Zooarchaeology: S. Hamilton-Dyer
Archaeobotany: M. Robinson n.d.
Elevation: 49
Geology: First (floodplain) terrace gravel deposits of Upper Thames valley.
Summary: Three SFBs and associated postholes, plus two rectilinear ditched enclosures, belong to the Anglo-Saxon phase, which may perhaps be dated to the 7th century. Handmade Saxon pottery is dominated by organic-tempered wares; a few sherds bear incised or stamped decoration. Bone from one SFB was C14-dated to cal.AD 545-659 (at 95% confidence). Sharply rectilinear enclosures are thought not to occur before the 7th c.
Site plan: After Pine & Ford 2003, p.142, fig.8.



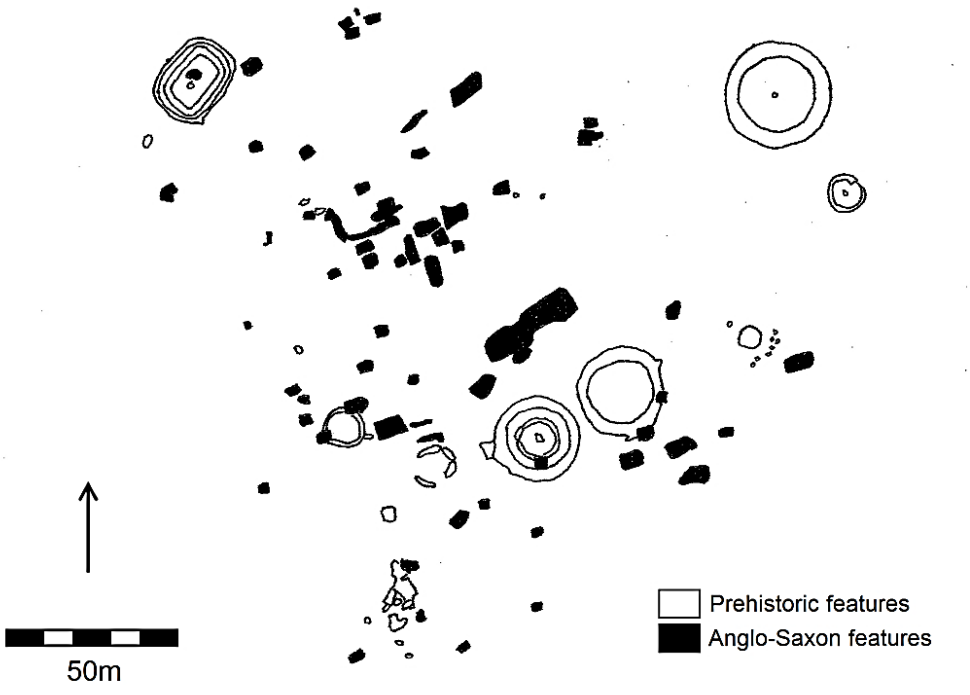
OX18: **Wantage** (Mill Street)
NGR: SU 3958 8814
Main reference: Holbrook & Thomas 1996
Zooarchaeology: M. Maltby
Archaeobotany: n/a
Elevation: 88
Geology: Near interface of clay vales and calcareous head deposits at scarp of Lambourn Downs.
Summary: A Romano-British site was overlain by a series of ditched enclosures, which were then filled; a silt layer – interpreted as a redeposited midden – overlies the ditches. The ditch fills and silt horizon are dated by the excavator to the Early Saxon period. Handmade Anglo-Saxon pottery is dominated by organic-tempered wares; a single sherd bears stamped decoration. Five complete and seven fragmentary loomweights were identified as being of 'annular' type. Morphologically, the enclosures are suggestive of a 7th c. or later date. In any case, much of the small faunal assemblage from the 'Saxon' phase is eroded and is considered by Maltby to represent redeposited Roman material.
Site plan: After Holbrook & Thomas 1996, p.126, fig.9.



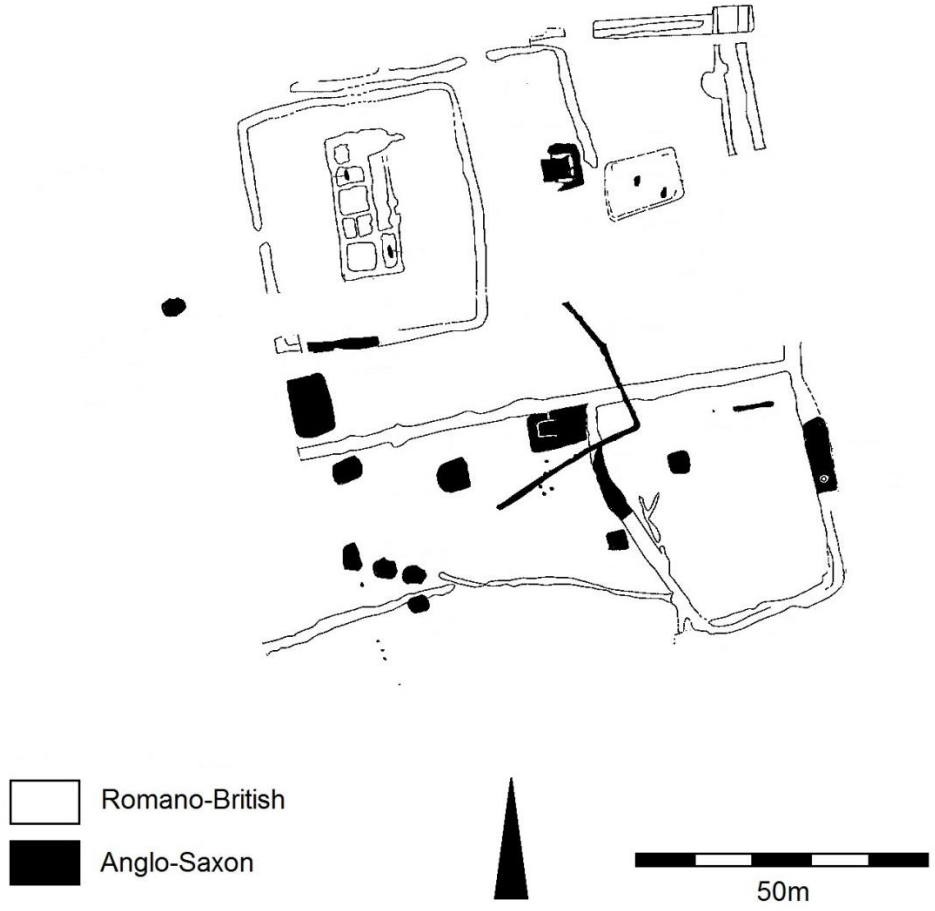
OX19: **Ashbury** (Shrivenham Road)
NGR: SU 2585 8575
Main reference: Hall 1998
Zooarchaeology: K. Rielly
Archaeobotany: n/a
Elevation: 99
Geology: Gault Clay.
Summary: A tentatively dated "Sub-Roman/Saxon" phase including parallel ditches and layer C8; most of the small faunal assemblage derives from C8, whose Saxon date is inferred from the presence of 23 sherds in various fabrics, and a spearhead and bronze pin of possible Saxon date; however, the majority of sherds in this layer are Roman.

OX20: **Goring** (Gatehampton Farm)
NGR: SU 606 797
Main reference: Allen *et al.* 1995
Zooarchaeology: B. Wilson
Archaeobotany: J. Letts
Elevation: 47
Geology: Thames gravel terrace.
Summary: A midden deposit and SFB are dated to the Anglo-Saxon period by a ceramic assemblage comprising several handmade fabrics; they produced a tiny faunal assemblage and a charred botanical sample. Additionally, a decorated sherd dated to the late 5th-6th centuries derives from a Roman grain oven, which may therefore have survived into the 5th-6th centuries.

OX21: **Barrow Hills** (Radley)
NGR: SU 5135 9815
Main reference: Chambers & McAdam 2007
Zooarchaeology: L. Barnetson
Archaeobotany: L. Moffett
Elevation: 60
Geology: Second gravel terrace of the Upper Thames.
Summary: 45 SFBs, 22 post-built structures, inhumations, pits, and fills of prehistoric barrow ditches, dated to between the 5th and early 7th centuries, by ceramic assemblage including variety of fabrics and decorative techniques (*e.g.* stamping, incising). Comprehensive sub-phasing is not available, and it is beyond the scope of this project to attempt further refinement.
Site plan: After Chambers & McAdam 2007, inside covers, fig.7.11.



OX22: **Barton Court Farm**
NGR: SU 510 978
Main reference: Miles 1986
Zooarchaeology: B. Wilson
Archaeobotany: M. Jones & M. Robinson
Elevation: 60
Geology: Edge of second gravel terrace of Upper Thames.
Summary: Anglo-Saxon occupation at Roman villa site, including Saxon sherds within fill of Late Roman ditch, suggesting occupation began before ditches had silted up. Pottery includes some stamped decoration. Inhumations on site include grave goods thought to be of 6th century date (*e.g.* beads). Overall, a 5th-6th century date may be preferred.
Site plan: After Chambers & McAdam 2007, p.299, fig.7.2.



OX23: **Audlett Drive** (Abingdon)
NGR: SU 505 973
Main reference: Keevill 1992
Zooarchaeology: B. Levitan
Archaeobotany: n/a
Elevation: 53
Geology: Gravel terrace of Upper Thames.
Summary: Three SFBs, producing a faunal assemblage, dated primarily by the ceramic assemblage, which includes sandy, calcareous and organic-tempered fabrics; not closely datable within 6th-9th centuries.

OX24: **Spring Road** (Abingdon)
NGR: SU 4875 9755
Main reference: Allen & Kamash 2008
Zooarchaeology: B.M. Charles
Archaeobotany: M. Robinson
Elevation: 59
Geology: Second gravel terrace of Upper Thames.
Summary: SFBs, postholes, and ditches are assigned to a 6th-7th century phase based upon the ceramic evidence, which includes sandy and organic-tempered fabrics; incised and (especially) stamped decoration is taken as an indicator of 6th century manufacture.

OX25: **Berinsfield** (Mount Farm)
NGR: SU 5822 9661
Main reference: Lambrick 2010
Zooarchaeology: B. Wilson
Archaeobotany: M. Jones & M. Robinson
Elevation: 58
Geology: Second terrace gravel in “saucer of Gault Clay”.
Summary: A multi-period site with scattered traces of Anglo-Saxon activity, including a waterhole, pit complexes, and a wattle-lined well. Wooden stakes from the latter are C14 dated to cal.AD 430-770 at 95% confidence. Chronological indicators are otherwise limited to annular and intermediate loomweights, and undiagnostic handmade Saxon pottery.

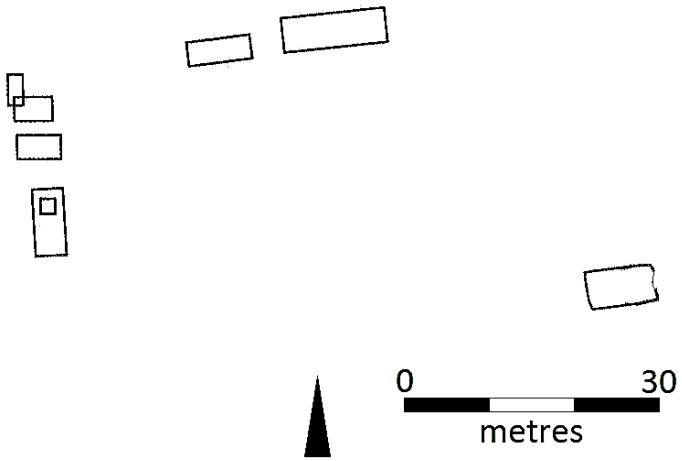
OX26: **Bishop’s Court** (Dorchester-on-Thames)
NGR: SU 574 946
Main reference: n/a
Zooarchaeology: n/a
Archaeobotany: M. Robinson 1981
Elevation: 50
Geology: Gravel terrace overlying Gault Clay.
Summary: Wells and a SFB; one of the wells, assigned a 5th-6th century date on ceramic grounds, produced a botanical sample.

OX27: **Beech House Hotel** (Dorchester-on-Thames)
NGR: SU 577 944
Main reference: Rowley & Brown 1981
Zooarchaeology: A. Grant
Archaeobotany: n/a
Elevation: 50
Geology: First gravel terrace of Upper Thames.
Summary: Post-Roman deposits of imprecise date produced a faunal assemblage, here provisionally classified as "Sub-Roman."

OX28: **Old Castle Inn** (Dorchester-on-Thames)
NGR: SU 578 942
Main reference: Bradley 1978
Zooarchaeology: A. Grant
Archaeobotany: n/a
Elevation: 50
Geology: First gravel terrace of Upper Thames.
Summary: Post-Roman deposits of imprecise date produced a faunal assemblage, here provisionally classified as "Sub-Roman."

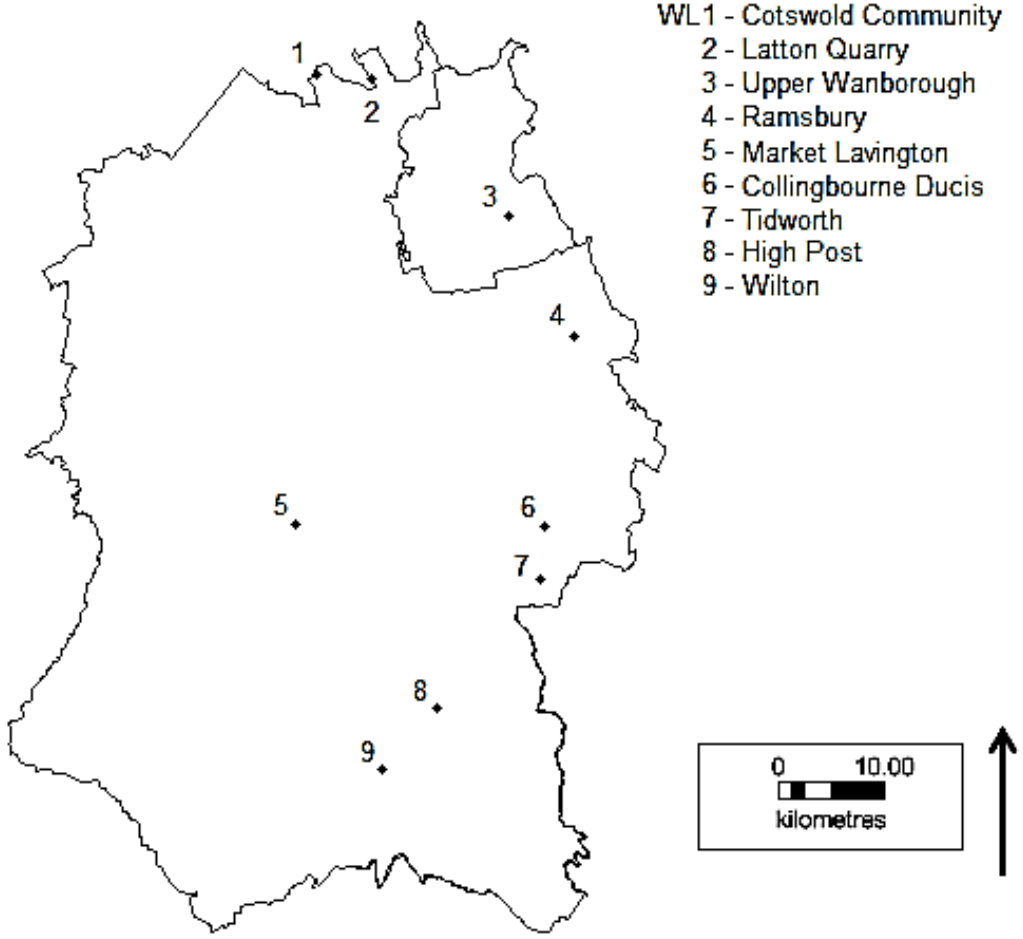
OX29: **Neptune Wood**
NGR: SU 550 937
Main reference: Allen *et al.* 2010
Zooarchaeology: F. Worley
Archaeobotany: R. Pelling
Elevation: 51
Geology: First gravel terrace of Upper Thames.
Summary: A group of pits containing undiagnostic Anglo-Saxon pottery; a faunal assemblage derives from two of the pits; two botanical samples derive from separate layers within a large pit. Charred barley grains from the samples are C14-dated to cal.AD 590-670 at 95% confidence.

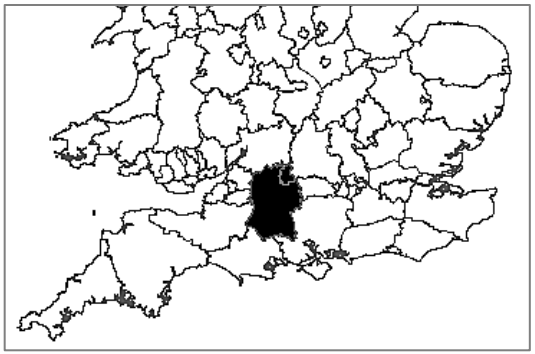
OX30: **Sutton Courtenay** (Drayton Road)
NGR: SU 490 936
Main reference: Hamerow *et al.* 2007
Zooarchaeology: B.M. Charles
Archaeobotany: M. Robinson
Elevation: 55
Geology: Second terrace gravel of Upper Thames.
Summary: Multi-period site with extensive Anglo-Saxon occupation; aerial survey and recent excavations have discovered a high-status complex of large timber halls of 7th century date.
Site plan: After Hamerow *et al.* 2007 p.188, Illus. 51.



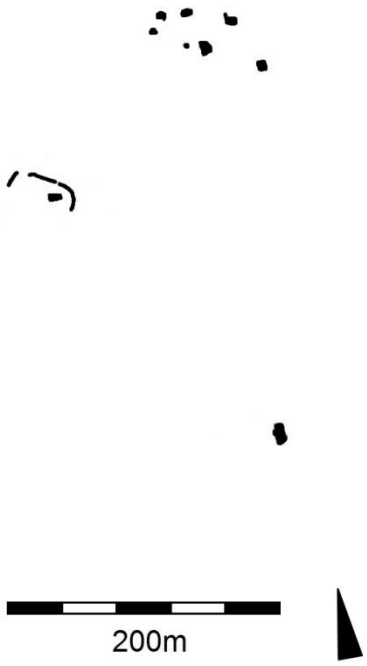
OX31: **Didcot** (Milton Park)
NGR: SU 4970 9235
Main reference: Williams 2008
Zooarchaeology: n/a
Archaeobotany: L. Evans
Elevation: 57
Geology: Second gravel terrace of Upper Thames.
Summary: Four botanical samples (not fully quantified), potentially associated with Early Saxon activity; dated by ceramic assemblage (including seven stamped sherds) to the 5th-7th centuries, perhaps centring on the 6th century. The dating of the samples is here considered tenuous.

Wiltshire


WL1 - Cotswold Community
2 - Latton Quarry
3 - Upper Wanborough
4 - Ramsbury
5 - Market Lavington
6 - Collingbourne Ducis
7 - Tidworth
8 - High Post
9 - Wilton
1
2
3
4
5
6
7
8
9
0
10.00
kilometres



WL1: **Cotswold Community** (Somerford Keynes)
NGR: SU 031 960
Main reference: Powell *et al.* 2010; Smith *et al.* 2010
Zooarchaeology: L. Strid
Archaeobotany: n/a
Elevation: 90
Geology: First gravel terrace of Upper Thames.
Summary: Early/Mid Saxon activity represented by series of post-built structures, pits and waterholes. Small pottery assemblage is of generic Early/Mid Saxon date (5th-9th centuries). A faunal assemblage derives from pits and waterhole.
Site plan: After Booth *et al.* 2007, p.107, fig.3.31.

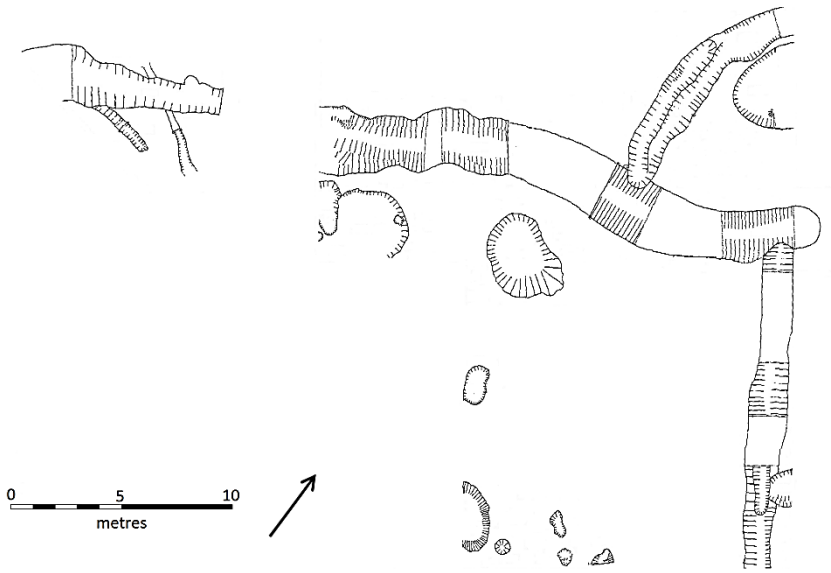


WL2: **Latton Quarry**
NGR: SU 083 956
Main reference: Pine 2009
Zooarchaeology: M. Holmes
Archaeobotany: L. Cramp
Elevation: 82
Geology: Gravel terrace of the Upper Thames.
Summary: Pits and a post-built structure, whose foundations include both postholes and trenches – the latter more common from the 7th century onwards; bone from a posthole was C14-dated to cal.AD 406-544 (at 95% confidence). A placed deposit of a cow skull in a pit was C14-dated to cal.AD 501-618 (at 71.2% confidence).

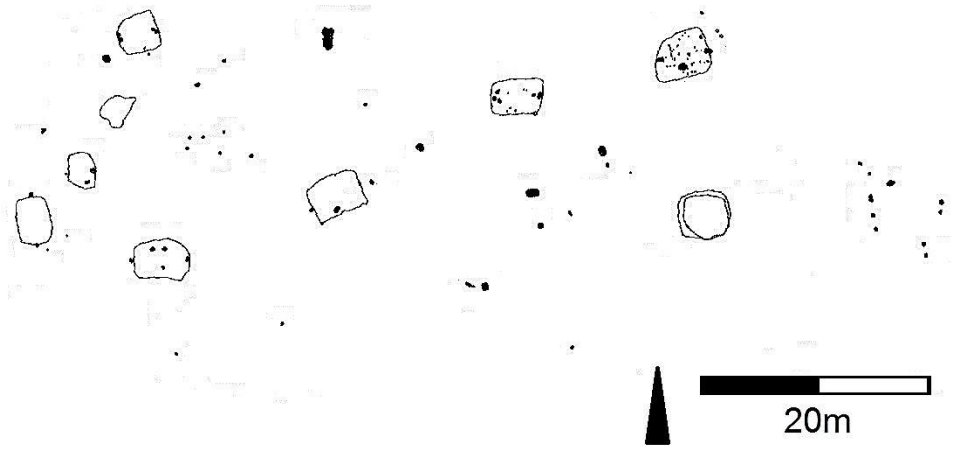
WL3:	**Upper Wanborough** (Pond Farm)
NGR:	SU 2103 8283
Main reference:	Weale & McNicoll-Norbury 2010
Zooarchaeology:	D. Milbank
Archaeobotany:	n/a
Elevation:	148
Geology:	Greensand with clay, and calcareous head deposits.
Summary:	Ditch with six sherds of Early/Mid Saxon pottery (all organic-tempered, but assemblage is arguably too small to support chronological deductions) and a faunal assemblage.

WL4:	**Ramsbury** (High Street)
NGR:	SU 272 715
Main reference:	Haslam *et al.* 1980
Zooarchaeology:	J. Coy
Archaeobotany:	n/a
Elevation:	111
Geology:	River gravels and clay-with-flints in Kennet valley.
Summary:	Iron smelting site, with faunal remains from successive phases of activity, dated to the 8th–9th and latter 9th century respectively. Dating is based upon C14-dating of charcoal and a small number of datable artefacts (*e.g.* strap ends).

WL5: **Market Lavington** (Grove Farm)
NGR: SU 0135 5415
Main reference: Williams & Newman 2006
Zooarchaeology: J. Bourdillon
Archaeobotany: V. Straker
Elevation: 100
Geology: Greensand ridge between chalk plateau of Salisbury Plain to south and Gault Clays to north.
Summary: Ditches, gullies, stakeholes, pits, and three SFBs, and a possible beamslot. The latter feature and the predominance of organic-tempered pottery suggest occupation centred on the 7th century or later.
Site plan: After Williams & Newman 2006 p.16, Fig.8.



WL6: **Collingbourne Ducis** (Cadley Road)
NGR: SU 24450 54000
Main reference: Pine 2001
Zooarchaeology: S. Hamilton-Dyer
Archaeobotany: J. Letts
Elevation: 132
Geology: Upper Chalk, with river gravels at west of site.
Summary: 10 SFBs, pits and postholes, producing charred plant remains, and small and medium faunal assemblages. The ceramic assemblage is dominated by organic-tempered sherds. Bone from SFB fills was C14-dated, suggesting that the main occupation sequence fell within the 7th-9th centuries, although one SFB returned an earlier determination of cal.AD 430-660.
Site plan: After Pine 2001, p.88, Fig.2.

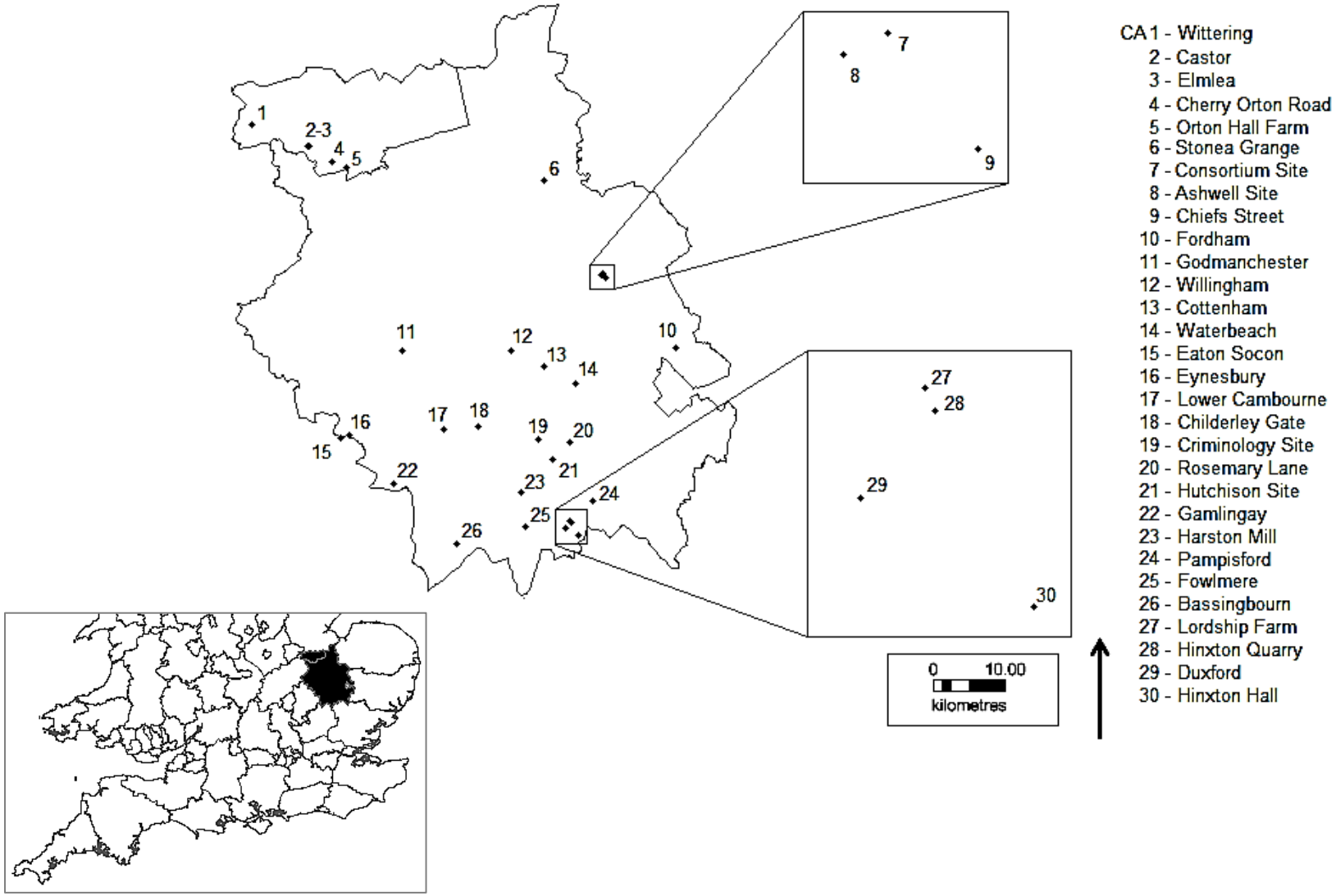


WL7: **Tidworth** (Matthew Estate)
NGR: SU 240 490
Main reference: Godden *et al.* 2002
Zooarchaeology: S. Hamilton-Dyer
Archaeobotany: n/a
Elevation: 130
Geology: Upper Chalk, in valley of the Bourne.
Summary: Two groups of pits with a faunal assemblage, of Early/Mid Saxon (5th-9th century) date. There are insufficient diagnostic pottery types to support a more refined chronology.

WL8:	**High Post** (Salisbury)
NGR:	SU 14400 37130
Main reference:	Powell 2011
Zooarchaeology:	n/a
Archaeobotany:	n/a
Elevation:	131
Geology:	Upper Chalk with bands of clay-with-flints.
Summary:	Romano-British masonry oven with T-shaped flue; post-Roman use could potentially be indicated by pedestal base of 5th-6th century type, and charred wheat grain from the base of the flue radiocarbon dated to cal.AD 335-535.

WL9:	**Wilton** (Wilton Autos, West St)
NGR:	SU 09420 31370
Main reference:	De'Athe 2008; De'Athe 2012
Zooarchaeology:	J. Grimm 2008
Archaeobotany:	R. Pelling
Elevation:	55
Geology:	Gravel spur between the Nadder and the Wylye.
Summary:	One large SFB (plus associated interior features, *e.g*. postholes and hearths), containing annular loomweights and two sherds of organic-tempered pottery. The artefactual evidence is slim, but the relatively large size of the SFB might support a 7th century date.

Cambridgeshire



CA 1 - Wittering
2 - Castor
3 - Elmlea
4 - Cherry Orton Road
5 - Orton Hall Farm
6 - Stonea Grange
7 - Consortium Site
8 - Ashwell Site
9 - Chiefs Street
10 - Fordham
11 - Godmanchester
12 - Willingham
13 - Cottenham
14 - Waterbeach
15 - Eaton Socon
16 - Eynesbury
17 - Lower Cambourne
18 - Childerley Gate
19 - Criminology Site
20 - Rosemary Lane
21 - Hutchison Site
22 - Gamlingay
23 - Harston Mill
24 - Pampisford
25 - Fowlmere
26 - Bassingbourn
27 - Lordship Farm
28 - Hinxton Quarry
29 - Duxford
30 - Hinxton Hall

CA1:	**Wittering** (Bonemills Farm)
NGR:	TF 0475 0153
Main reference:	Wall 2011
Zooarchaeology:	n/a
Archaeobotany:	A. Clapham
Elevation:	50
Geology:	Ironstone outcrop.
Summary:	Iron smelting site comprising furnaces, hearths and pits. Charcoal from the features was C14-dated to cal.AD 575-875, 680-905, and 920-950 (at 95% confidence), but it is suggested that all features might in fact be contemporary. Environmental samples were dominated by charcoal, but semi-quantitative data for charred grain/seeds are provided for three samples.

CA2:	**Castor**
NGR:	TL 1244 9847
Main reference:	Green *et al.* 1987
Zooarchaeology:	R.T. Jones
Archaeobotany:	n/a
Elevation:	12
Geology:	Limestone, with river gravels in vicinity.
Summary:	Pits and "huts" with faunal remains, whose chronology is uncertain because of the very small quantities of Ipswich and Maxey-type wares; a 7th century date is suggested in the published report.

CA3:	**Elmlea**
NGR:	TL 125 985
Main reference:	Green *et al.* 1987
Zooarchaeology:	R.T. Jones
Archaeobotany:	n/a
Elevation:	14
Geology:	Limestone, with river gravels in vicinity.
Summary:	Pit dated with faunal remains to the Mid Saxon period (7th-9th centuries) by the presence of Ipswich Ware, Maxey-type wares, and a bone comb of 7th century or later type.

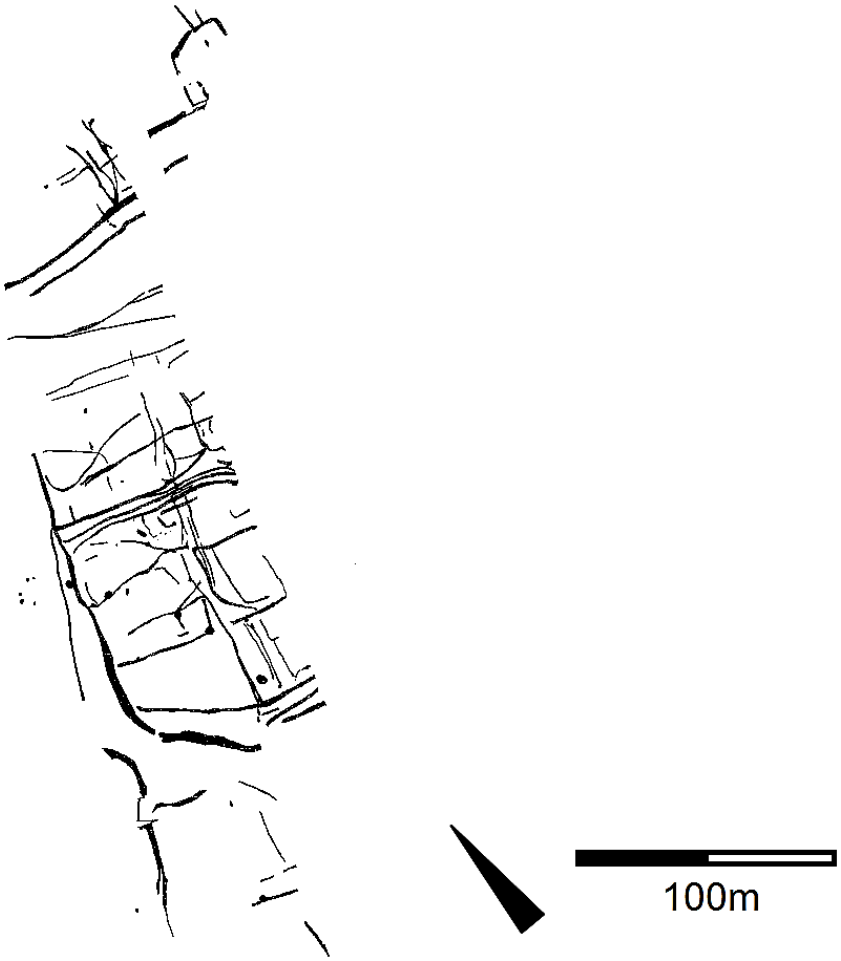
CA4: **Cherry Orton Road** (Orton Waterville)
NGR: TL 1568 9627
Main reference: Wright 2004
Zooarchaeology: S. Knight
Archaeobotany: C. Stevens
Elevation: 16
Geology: Gravel terrace of the Nene.
Summary: Two pits (one of which may be a SFB) and an arrangement of ditches; the ceramic assemblage lacks diagnostic forms, fabrics or decoration but – in conjunction with the linear ditch systems – would be consistent with a 7th century or later date.
Site plan: After Wright 2004, p.25, fig.2.



CA5: **Orton Hall Farm**
NGR: TL 1765 9555
Main reference: Mackreth 1996
Zooarchaeology: J. King
Archaeobotany: n/a
Elevation: 20
Geology: Oxford Clay and river terrace gravels.
Summary: Complicated transitional 'Anglo-Saxon' phase at a Roman villa, extending into the 5th/6th century, dated by a comb of late 4th/early 5th c. type, late 5th/early 6th c. copper alloy plates, and pottery bearing stamped, bossed and grooved decoration. Sub-phasing proved unfeasible.

CA6:	**Stonea Grange**
NGR:	TL 449 937
Main reference:	Jackson & Potter 1996
Zooarchaeology:	S. Stallibrass
Archaeobotany:	M. van der Veen
Elevation:	4
Geology:	Sand and gravel deposits constitute the fen 'island' of Stonea (in the peat fens).
Summary:	Post-Roman phase of a Roman settlement, comprising at least four post-built structures along the line of a Roman road, plus enclosure ditches and pits; the ceramic assemblage, including some stamped sherds, is given a broad 5th-7th century date range. The phase is here provisionally classified as 'Sub-Roman.' Data for the botanical samples from this phase is presented in amalgamated form, *i.e.* as an entire assemblage.

CA7:	**Consortium Site** (West Fen Road, Ely)
NGR:	TL 531 809
Main reference:	Mudd & Webster 2011
Zooarchaeology:	L. Higbee
Archaeobotany:	W.J. Carruthers
Elevation:	6
Geology:	Kimmeridge Clay; some sand and sandstone elsewhere on the 'island' of Ely.
Summary:	Series of shallow ditched enclosures, plus pits, a possible well, and gullies and posthole alignments that hint at structures. Maxey-type and Ipswich Ware dominated the ceramic assemblage, suggesting that occupation centred on the 8th-9th centuries; a *sceatta* dated *c.*AD 740-50, and loomweights resembling the Mid Saxon 'intermediate' type, lend further support to this chronology.
Site plan:	After Mortimer *et al.* 2005, p.145, fig.7.1.

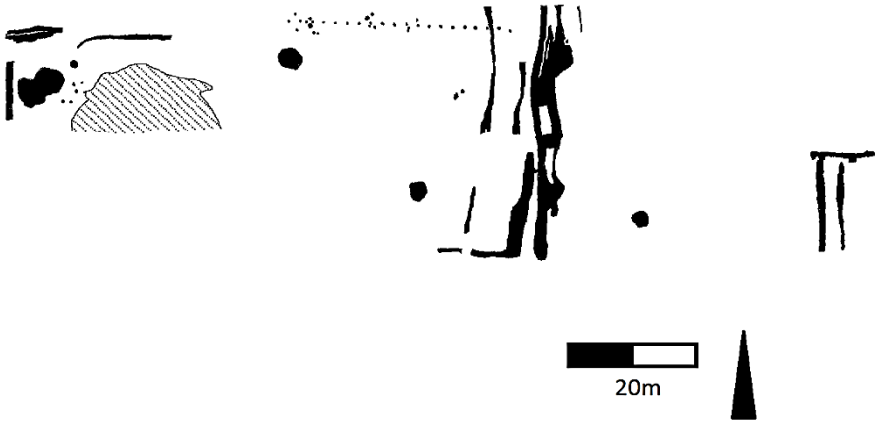


CA8: **Ashwell Site** (West Fen Road, Ely)
NGR: TL 529 808
Main reference: Mortimer *et al.* 2005
Zooarchaeology: L. Higbee
Archaeobotany: R. Ballantyne
Elevation: 9
Geology: Kimmeridge Clay; some sand and sandstone elsewhere on the 'island' of Ely.
Summary: Ditched enclosures, pits, post-built structures and a possible trackway. The dominance of Ipswich Ware in the ceramic assemblage, along with a *sceatta* dated *c.*AD 730-40, suggests an 8th-9th century chronology.
Site notes: After Mortimer *et al.* 2005, p.145, fig.7.1.

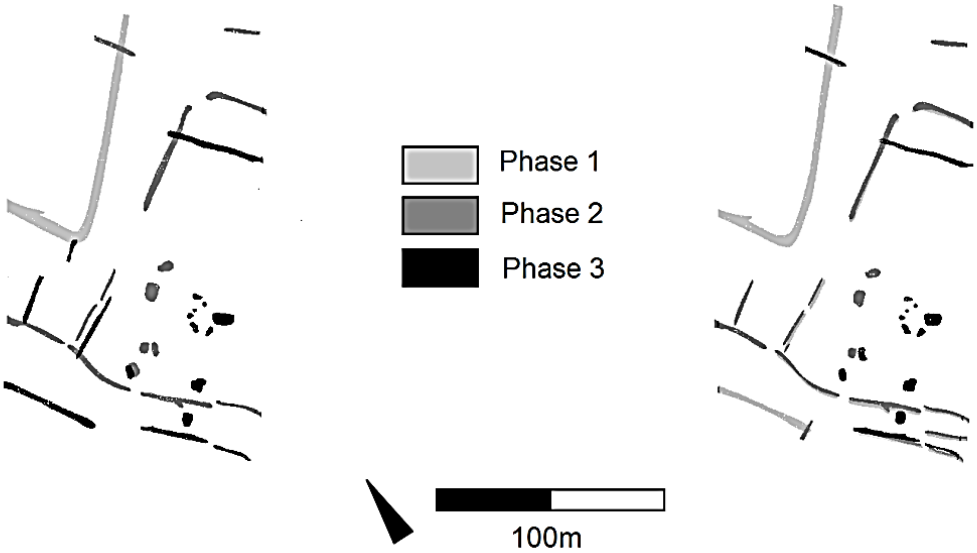


CA9: **Chiefs Street** (Ely)
NGR: TL 5356 8042
Main reference: Kenney 2002
Zooarchaeology: I. Baxter
Archaeobotany: C. Stevens
Elevation: 21
Geology: Lower Greensand at highest point of Ely island.
Summary: Pits, wells and an oven dated to the Mid Saxon period by a ceramic assemblage consisting mostly of Ipswich Ware, but also including some Maxey-type ware.

CA10: **Fordham** (Hillside Meadow)
NGR: TL 632 706
Main reference: Patrick & Rátkai 2011
Zooarchaeology: I. Baxter
Archaeobotany: W. Smith
Elevation: 15
Geology: River terrace deposits and chalk.
Summary: Three or four SFBs, and ditches marking enclosures and a droveway; the ceramic assemblage includes both Early (stamped sherd) and Mid Saxon (Ipswich Ware) indicators, but morphology of the site would be more consistent with a 7th century or later date.
Site plan: After Patrick & Rátkai 2011, p.43, fig.3.2.



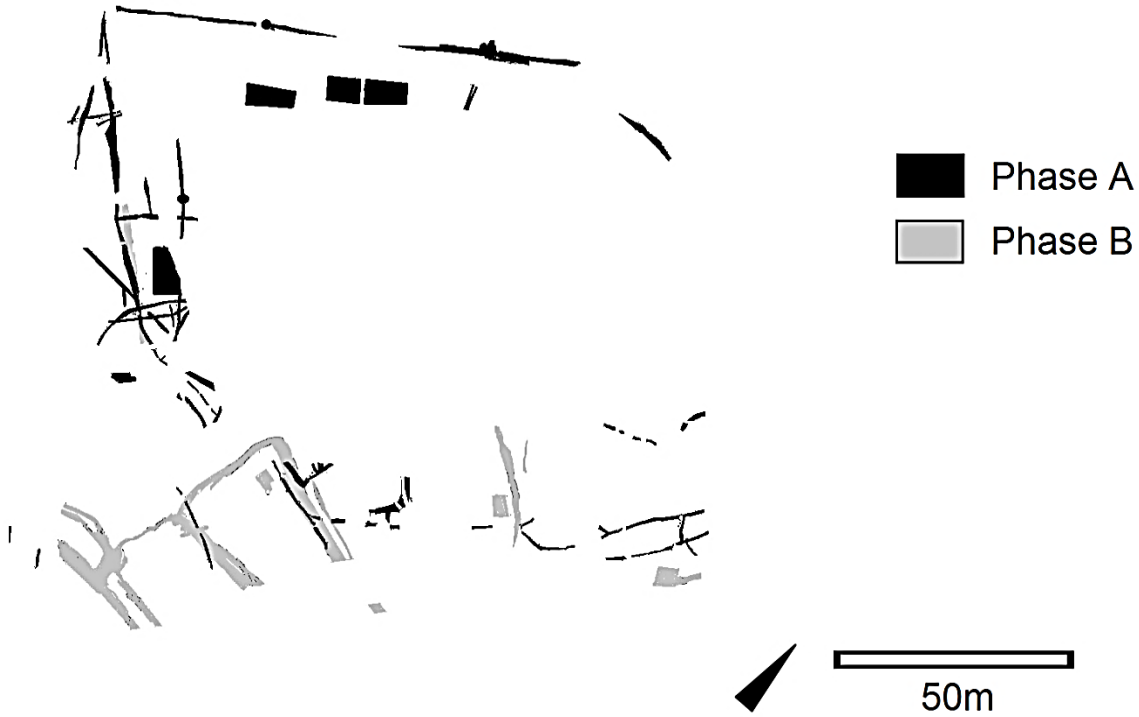
CA11: **Godmanchester** (Cardinal Distribution Park)
NGR: TL 2550 7030
Main reference: Gibson 2003a
Zooarchaeology: I. Baxter
Archaeobotany: V. Fryer
Elevation: 13
Geology: Interface of first and second gravel terraces and Oxford Clay.
Summary: Six SFBs, ditched enclosure system, and traces and post-built structures; three phases of development, with two suggested sequences (illustrated). The published report favours an Early Saxon date, but the site morphology, the presence of both annular and intermediate loomweights, and a small amount of Ipswich Ware (six sherds from the same segment of a ditch) are arguably more consistent with a 7th-8th century date.
Site plan: After Gibson 2003, p.204, fig.42.



CA12: **Willingham** (High Street)
NGR: TL 4040 7037
Main reference: Fletcher 2008
Zooarchaeology: C. Faine
Archaeobotany: V. Fryer
Elevation: 6
Geology: First terrace sand and gravel deposits and Ampthill Clays.
Summary: Post-built structure, other postholes, pits, and possibly a ditch, dated to the 8th-9th centuries by Ipswich Ware and North French Blackware.
Site plan: After Fletcher 2008, p.9, fig.3.



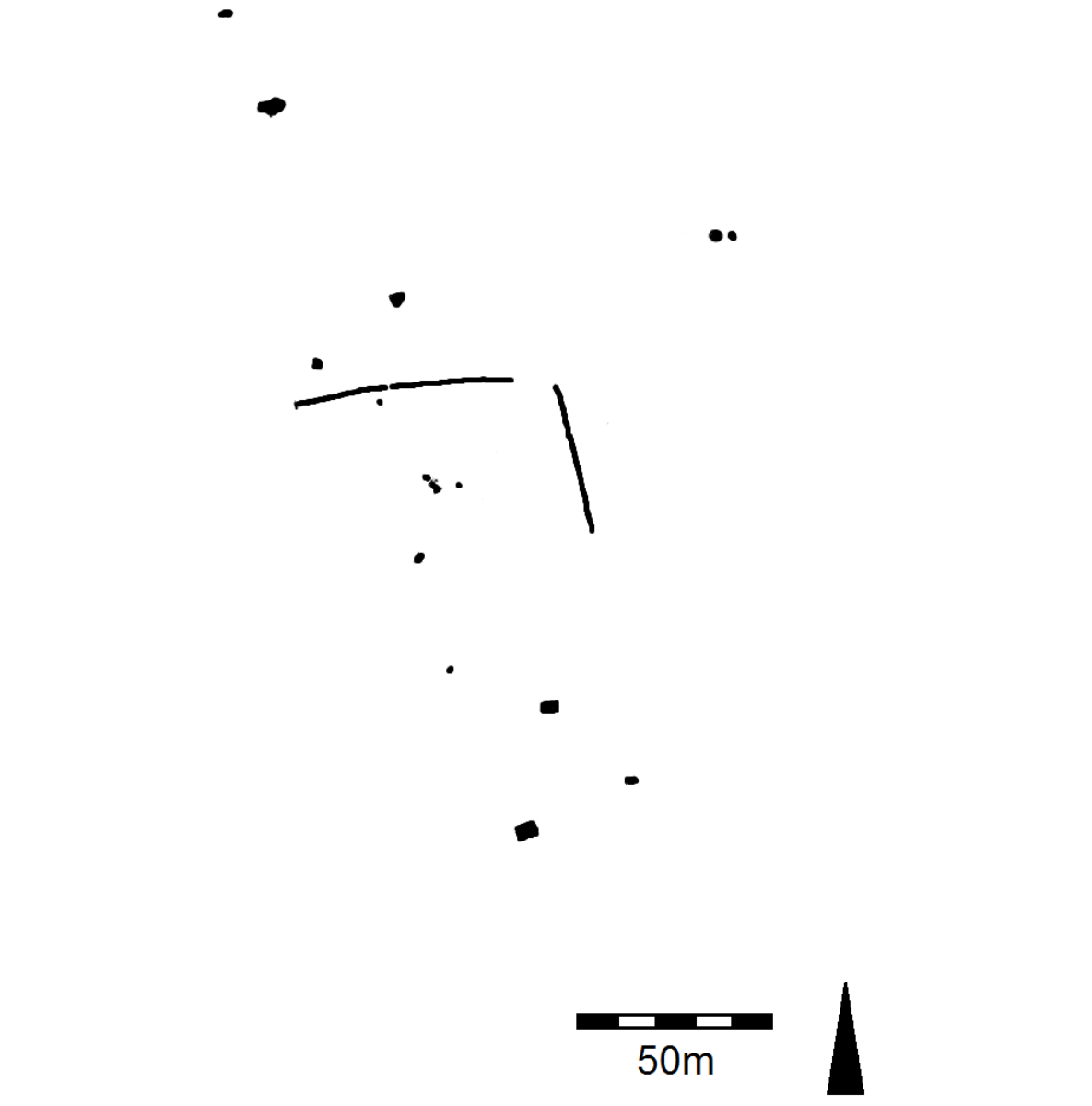
CA13: **Cottenham** (Lordship Lane)
NGR: TL 449 681
Main reference: Mortimer 1998; 2000
Zooarchaeology: L. Higbee
Archaeobotany: C. Stevens
Elevation: 10
Geology: Ridge of Lower Greensand, overlying Kimmeridge Clay.
Summary: An extensive ditch system with post-built structures and one SFB; subsequently new enclosures were created, apparently representing radial growth from an unseen core, south-east of the excavated site. Varying proportions of Ipswich Ware in the respective ceramic assemblages suggest that the first phase is of 7th-8th century date, with the second phase falling within the 8th-9th centuries.
Site plan: After Mortimer 2000, pp.9–10, fig.7 and 9.



CA14: **Waterbeach** (Denny End)
NGR: TL 4935 6572
Main reference: Mortimer 1996
Zooarchaeology: E. Yannouli
Archaeobotany: C. Stevens
Elevation: 6
Geology: Second terrace river gravels and sands.
Summary: SFB, pits, postholes and hollows are assigned an Early Saxon date by the excavator; a plain bowl and some decorated sherds are said to fall within the 5th-6th c. period, and Ipswich Ware is absent. Dating is thus somewhat tentative, but in any case the faunal and botanical assemblages from these features are of relatively low abundance.

CA15: **Eaton Socon** (Alpha Park, Bell Farm, Great North Road)
NGR: TL 168 581
Main reference: Hood 2007
Zooarchaeology: n/a
Archaeobotany: W. Smith
Elevation: 19
Geology: River terraces gravels and sands.
Summary: SFB with 20 sherds of handmade 'Early Saxon' pottery of sandy fabric in its fill; one rim sherd of a globular vessel with marked shoulder, wide mouth and upright rim is considered analogous to a form dated by Myres to the 5th century. Two supposedly curated Romano-British sherds derive from the same fill.

CA16:	**Eynesbury**
NGR:	TL 180 585
Main reference:	Ellis 2004
Zooarchaeology:	N. Sykes
Archaeobotany:	A. Clapham
Elevation:	15
Geology:	First and second gravel terraces of the Great Ouse.
Summary:	Seven SFBs, plus pits, postholes and ditches. Annular loomweights, plus pottery bearing bossed, incised, and impressed decoration (and with a relatively low occurrence of organic-tempered sherds), might support a 5th-6th century date.
Site plan:	After Ellis 2004, p.50, fig.27.



CA17:	**Lower Cambourne**
NGR:	TL 31080 59460
Main reference:	Wright *et al.* 2009
Zooarchaeology:	n/a
Archaeobotany:	C. Stevens
Elevation:	63
Geology:	Boulder clay.
Summary:	Poorly represented post-Roman activity consisting mainly of pits/wells, and possibly the upper fills of a Roman ditch. The contexts are not closely datable within the Early/Mid Saxon period. Two botanical samples derive from a pit/well and the ditch fill respectively, but it is suspected that the macrofossils may be residual or reworked.

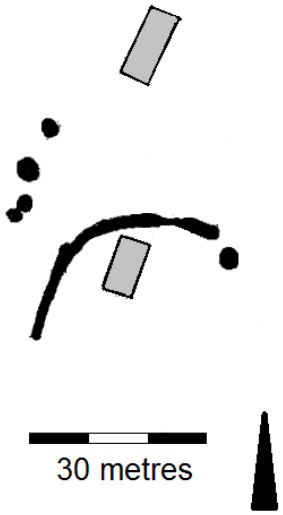
CA18:	**Childerley Gate**
NGR:	TL 359 598
Main reference:	Abrams & Ingham 2008
Zooarchaeology:	K. Rielly
Archaeobotany:	J. Giorgi
Elevation:	65
Geology:	Boulder clay and degraded chalk outcrops in Bourn valley.
Summary:	A 'Sub-Roman' phase, in which a 'dark earth' overlies 4th-century features; pottery includes types described as 'very late Roman' and grog-tempered 'proto-Saxon.'

CA19: **Criminology Site** (Sidgwick Campus, Cambridge)
NGR: TL 4428 5812
Main reference: Dodwell *et al.* 2004
Zooarchaeology: C. Swaysland
Archaeobotany: K. Roberts
Elevation: 9
Geology: Second gravel terrace of the Cam.
Summary: A post-built structure, pits and two SFBs. The ceramic assemblage includes one stamped and one incised sherd, and organic-tempered fabrics constitute 40% of the assemblage by weight. The assemblage is considered to be consistent with a 6th-7th century date.
Site plan: After Dodwell *et al.* 2004, p.111, fig.25.



CA20: **Rosemary Lane** (Cherry Hinton)
NGR: TL 485 576
Main reference: Mortimer 2003
Zooarchaeology: C. Swaysland
Archaeobotany: K. Roberts
Elevation: 15
Geology: Lower Chalk.
Summary: Ditches and shallow pits or hollows, dated by Ipswich Ware to the 8th-9th centuries.

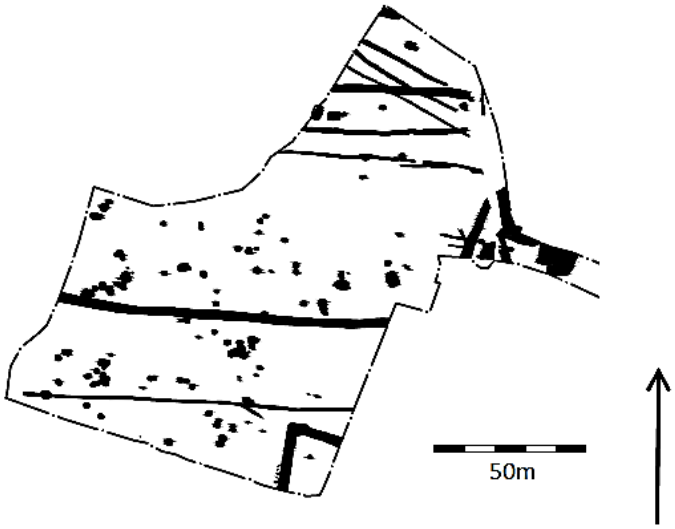
CA21: **Hutchison Site** (Addenbrooke's Hospital, Cambridge)
NGR: TL 4622 5535
Main reference: Evans *et al.* 2008
Zooarchaeology: C. Swaysland
Archaeobotany: K. Roberts
Elevation: 17
Geology: Lower Chalk, with second and third terrace gravels nearby.
Summary: Curvilinear ditch, pit, wells and two post-built structures are dated to the Mid Saxon period, with a focus perhaps in the 8th-9th centuries. The dating of the post-built structures and some of the wells is circumstantial (based upon spatial relationship with the ditch); other features are dated by the presence of Ipswich Ware, plus a C14 date from a clunch block in one of the wells (cal. AD 660-790).
Site plan: After Evans *et al.* 2008, p.93, fig.2.40.



CA22: **Gamlingay** (Station Road)
NGR: TL 2430 5190
Main reference: Murray 2005
Zooarchaeology: T. Roberts
Archaeobotany: V. Fryer
Elevation: 47
Geology: Low rise in Lower Greensand ridge.
Summary: Sequence of enclosed 'farmsteads' comprising ditch systems (enclosures, droveways), SFBs, post-built structures and pits. Annular loomweights and Charnwood Forest pottery may indicate Early Saxon activity, but the site morphology and occurrence of Maxey-type wares would be more consistent with a 7th century or later date for the enclosed settlement sequence, including 8th-9th century features dated by Ipswich Ware.
Site plan: After Murray 2005, p.182, fig.10.



CA23: **Harston Mill**
NGR: TL 418 507
Main reference: O'Brien (in press)
Zooarchaeology: R. Jones & C. Phillips
Archaeobotany: R. Scaife
Elevation: 15
Geology: Chalk and gravelly clay.
Summary: Early-Mid Saxon sequence at multi-period site, including six SFBs, several pits, and a series of parallel, linear ditches. Some Early Saxon (5th-7th c.) features, mainly SFBs, are dated by stamped and grooved handmade pottery and a bone radiocarbon-dated to cal.AD 570-660; some Mid Saxon (8th-9th c.) features are dated by Ipswich Ware, but many features could be assigned only a Generic (5th-9th c.) chronology on available evidence.
Site plan: After O'Brien (in press), fig.6.1.



CA24: **Pampisford** (Bourn Bridge)
NGR: TL 516 495
Main reference: Pollard 1996
Zooarchaeology: E. Yannouli
Archaeobotany: V. Fryer & P. Murphy
Elevation: 27
Geology: Gravel terrace of the Granta (tributary of the Cam).
Summary: Anglo-Saxon settlement within relict Romano-British field system, consisting of SFBs, pits, hollows, and – on the floodplain to the NW – a post-built structure which is said to be of 7th century type. Distinctively Early and Mid Saxon pottery types are lacking, so the whole settlement could be of 7th century date.

CA25: **Fowlmere** (Round Moat/High Street)
NGR: TL 4235 4590
Main reference: Spoerry & Hinman 2007
Zooarchaeology: Baxter 1999
Archaeobotany: n/a
Elevation: 24
Geology: Chalk.
Summary: One SFB, whose fill contained a small number of animal bones, and organic- and mineral-tempered pottery (some with stamped/bossed decoration) perhaps consistent with a 6th century date.

CA26: **Bassingbourn** (Village College)
NGR: TL 3299 4355
Main reference: Phillips 2009
Zooarchaeology: C. Faine
Archaeobotany: n/a
Elevation: 30
Geology: Chalk.
Summary: One SFB, postholes, a pit and a possible well. A small ceramic assemblage can be dated only broadly to the Early/Mid Saxon period.

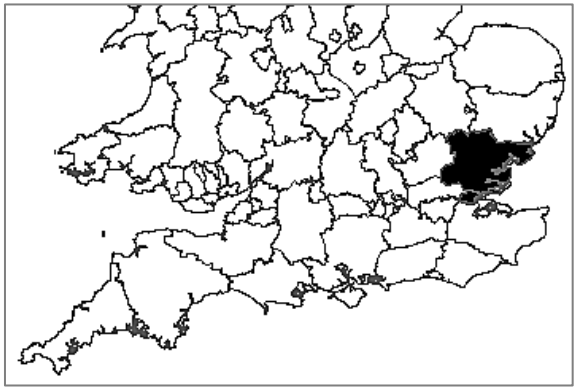
CA27: **Lordship Farm** (Hinxton)
NGR: TL 486 468
Main reference: Gibson 2003b
Zooarchaeology: I. Baxter 2000
Archaeobotany: n/a
Elevation: 25
Geology: Gravels.
Summary: Three SFBs, producing a small number of animal bones. The ceramic assemblage, containing sherds of a bossed vessel with stamped and incised lines, and lacking any 'heavily grass-tempered fabrics', would be consistent with a 5th-6th century date.

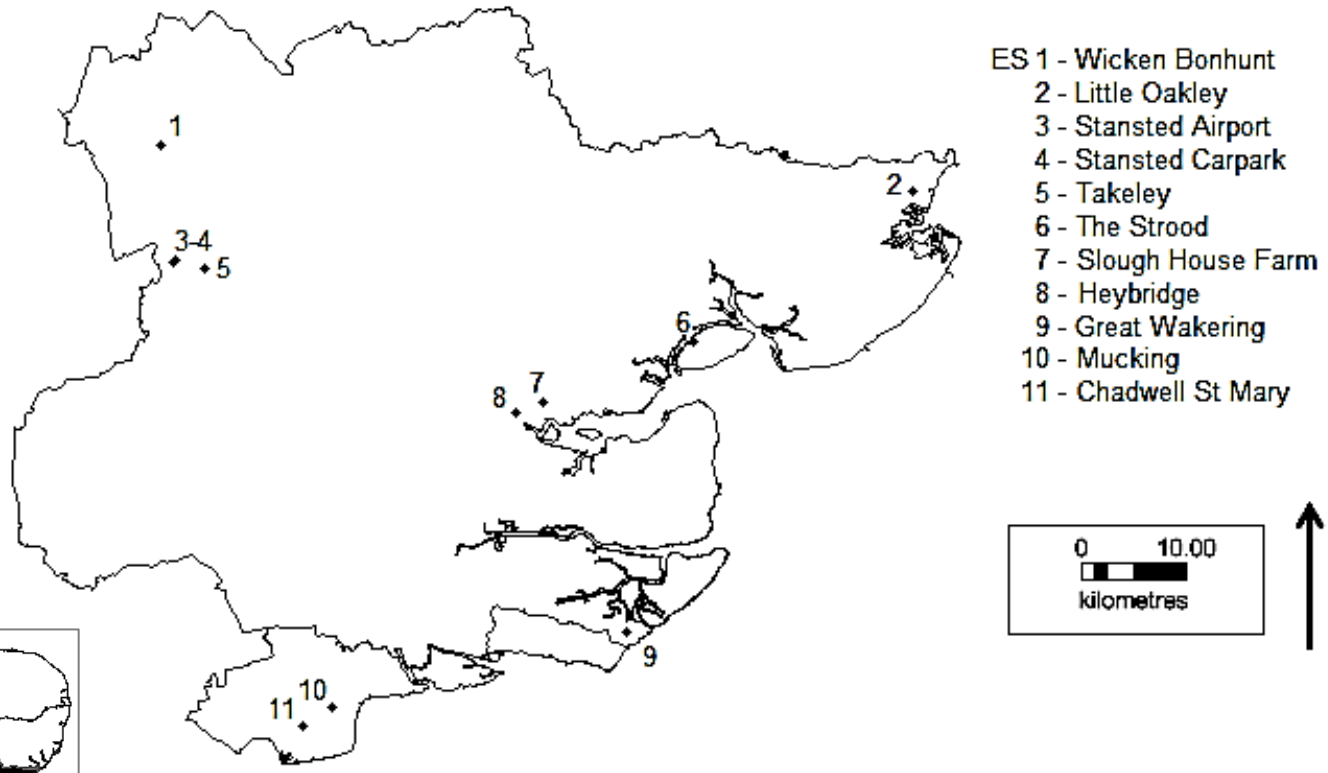
CA28:	**Hinxton Quarry**
NGR:	TL 487 466
Main reference:	Mortimer & Evans 1996
Zooarchaeology:	E. Yannouli
Archaeobotany:	C. Stevens
Elevation:	25
Geology:	Gravels.
Summary:	Pits and two SFBs, producing a small faunal assemblage and a single botanical sample. The ceramic assemblage includes a single stamped sherd, plus short-necked vessels with 6th century parallels.

CA29:	**Duxford**
NGR:	TL 4805 4585
Main reference:	Lyons 2011
Zooarchaeology:	I. Baxter
Archaeobotany:	n/a
Elevation:	29
Geology:	Chalk.
Summary:	Three SFBs, a post-built structure, pits, a gully and fence-line, respecting a Romano-British 'drying building' may therefore have continued to stand. Dating is uncertain: annular loomweights and various handmade pottery fabrics would be consistent with a 5th-7th century date, but some shelly ware resembles Mid Saxon Maxey-type ware.

CA30:	**Hinxton Hall**
NGR:	TL 496 448
Main reference:	Gaimster *et al.* 1998 p.119
Zooarchaeology:	L. Gidney (NISP data cited by Baxter in Patrick & Rátkai 2011 p.86)
Archaeobotany:	n/a
Elevation:	37
Geology:	Chalk and terrace gravels of the Cam.
Summary:	Four SFBs and a timber hall, producing a medium-sized faunal assemblage. Detailed dating evidence could not be obtained, but the site is described as 'Early Saxon'.

Essex




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11
ES 1 - Wicken Bonhunt
2 - Little Oakley
3 - Stansted Airport
4 - Stansted Carpark
5 - Takeley
6 - The Strood
7 - Slough House Farm
8 - Heybridge
9 - Great Wakering
10 - Mucking
11 - Chadwell St Mary
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10.00
kilometres

ES1:	**Wicken Bonhunt**
NGR:	TL 511 335
Main reference:	Wade 1980
Zooarchaeology:	P. Crabtree 2012
Archaeobotany:	A.K.G. Jones n.d.
Elevation:	65
Geology:	Gravel and sandy clay.
Summary:	Ditch systems, wells, a possible mill-leat, and post-built structures dated by Ipswich Ware, imported French wares, and timbers (C14-dated to cal.AD 780-880) to the 8th-9th centuries. Pits and ditches of a preceding phase, associated with handmade sand-tempered pottery, are presumed to date from between the 6th and early 8th centuries.
Site plan:	After Wade 1980, p.97, fig.38.



ES2:	**Little Oakley**
NGR:	TM 2225 2916
Main reference:	Barford 2002
Zooarchaeology:	P.M. Barford, I.W. Cornwall & B. Meddens
Archaeobotany:	n/a
Elevation:	23
Geology:	Glacial sands, silty loams and gravels, with London Clay outcrop just below the site.
Summary:	Post-Roman phase at a villa site, with faunal assemblage and ceramics including organic-tempered sherds (some stamped) in pits, ditches and layers; also a brooch of 5th century type. An oven is also assigned to this phase, which could be considered "Sub-Roman" or 'Early Saxon.'

ES3:	**Stansted Airport**
NGR:	TL 523 224
Main reference:	Havis & Brooks 2004
Zooarchaeology:	n/a
Archaeobotany:	P. Murphy
Elevation:	100
Geology:	Boulder clay plateau.
Summary:	A pit and shallow depression, whose fills are assigned a 6th-7th century date by the ceramic assemblage, which is dominated by organic-tempered sherds and includes some incised decoration.

ES4:	**Stansted Carpark**
NGR:	TL 524 227
Main reference:	Cooke *et al.* 2008
Zooarchaeology:	n/a
Archaeobotany:	n/a
Elevation:	100
Geology:	Boulder clay plateau.
Summary:	A hearth/oven with *in situ* burning; charcoal C14-dated to cal.AD 680-890.

ES5:	**Takeley**
NGR:	TL 553 218
Main reference:	Timby *et al.* 2007
Zooarchaeology:	n/a
Archaeobotany:	n/a
Elevation:	90
Geology:	Boulder clay plateau.
Summary:	A post-built structure, tentatively interpreted as a barn or storehouse; charcoal from a posthole fill is C14-dated to cal.AD 670-880.

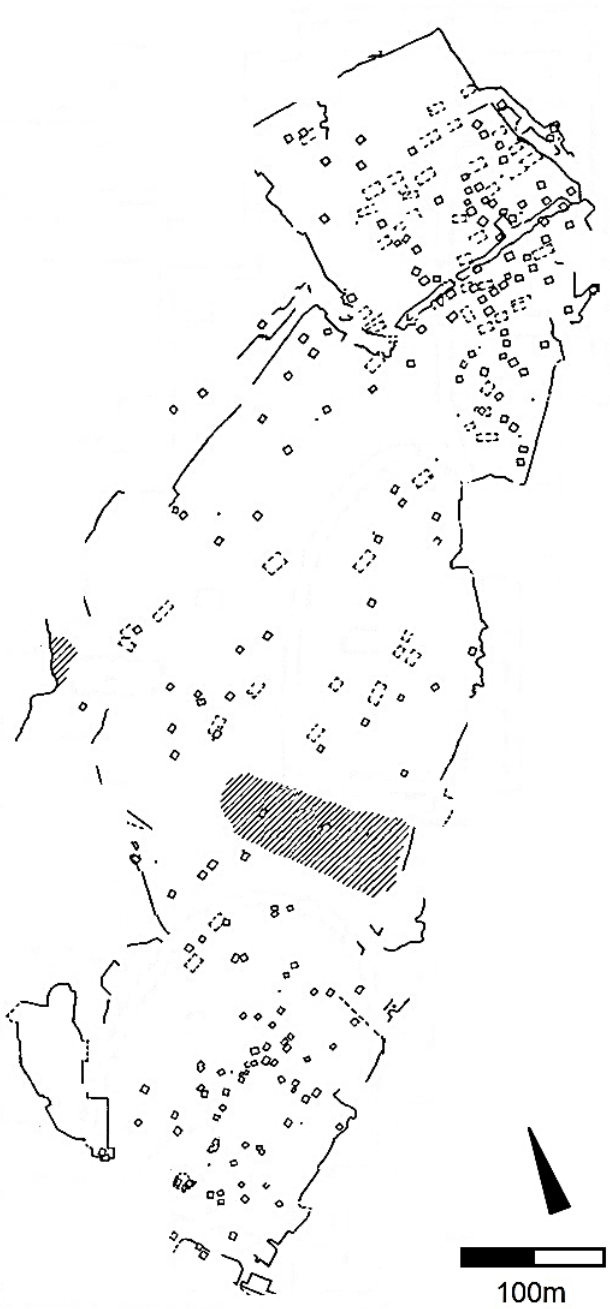
ES6: **The Strood**
NGR: TM 0150 1485
Main reference: Crummy *et al.* 1982
Zooarchaeology: n/a
Archaeobotany: n/a
Elevation: 3
Geology: Alluvium overlying London Clay.
Summary: Oak piles of an artificial causeway; dendrochronology suggests felling dates *c.*AD 684-702.

ES7: **Slough House Farm**
NGR: TL 873 091
Main reference: Wallis & Waughman 1998
Zooarchaeology: n/a
Archaeobotany: P. Murphy
Elevation: 10
Geology: River terrace gravels.
Summary: Pits, wells and postholes. Dendrochronology suggests that the wells post-date AD 599 and AD 602/3 respectively. One potsherd bears incised chevron decoration. Botanical samples from the wells are provisionally considered to be of 7th century date.

ES8: **Heybridge** (Elms Farm)
NGR: TL 847 082
Main reference: Atkinson & Preston 1998
Zooarchaeology: Johnstone & Albarella 2002
Archaeobotany: n/a
Elevation: 4
Geology: River terrace gravels.
Summary: Postholes, post-built structures and SFBs in a 'Sub-Roman' phase of a Romano-British settlement, for which precise dating evidence could not be obtained.

ES9: **Great Wakering** (St Nicholas' church)
NGR: TQ 9503 8755
Main reference: Dale *et al.* 2010
Zooarchaeology: n/a
Archaeobotany: V. Fryer (data not fully integrated into this project's dataset).
Elevation: 5
Geology: Brickearth, overlying Barling Gravels terrace.
Summary: Possible site of a Mid-Late Saxon minster church; features include enclosure ditches, a piece of carved stone, and a 'composite hearth' (possibly a grain oven). Shelly fabrics and predominance of organic-tempered ware, along with the enclosure ditches and putative monastic associations, suggest a 7th century or later date. The carved stone is assigned a late 8th-10th century date, partly on stylistic grounds.

ES10: **Mucking**
NGR: TQ 673 803
Main reference: Hamerow 1993
Zooarchaeology: G. Done
Archaeobotany: M. van der Veen
Elevation: 30
Geology: Gravel terrace.
Summary: 203 SFBs, 53 post-built structures, plus pits, ditches and hearths in a 'drifting' settlement sequence. Detailed examination of the ceramic assemblage, in conjunction with some metalwork in SFB fills, suggests three main phases dating to the 5th century, the 5th-6th centuries, and the 6th-early 8th centuries respectively.
Site plan: After Hamerow 1991, p.4, fig.1.



ES11:	**Chadwell St Mary** (County Primary School)
NGR:	TQ 6450 7854
Main reference:	Lavender 1998
Zooarchaeology:	n/a
Archaeobotany:	V. Fryer & P. Murphy
Elevation:	30
Geology:	Gravel terrace.
Summary:	SFB, with a ceramic assemblage dominated by organic-tempered wares, and including a carinated shoulder sherd. A 6th century date is suggested, but the material would seem to be consistent with a late 6th-7th century date, or possibly even later.

Norfolk

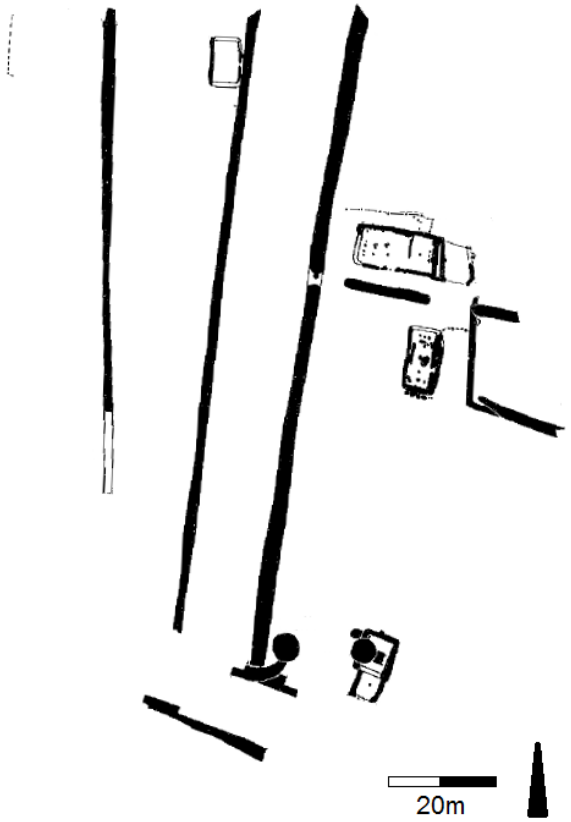


NO 1 - Sedgeford
2 - Witton
3 - North Elmham Park
4 - Spong Hill
5 - Terrington St Clement
6 - Walpole St Andrew
7 - Ingleborough
8 - Marham
9 - Bowthorpe
10 - Caister-on-Sea
11 - Outwell
12 - Downham Market Bypass
13 - London Road
14 - Wymondham
15 - Two Mile Bottom
16 - Kilverstone
17 - Brandon Road North
18 - Redcastle Furze
19 - Brandon Road South
20 - Brettenham

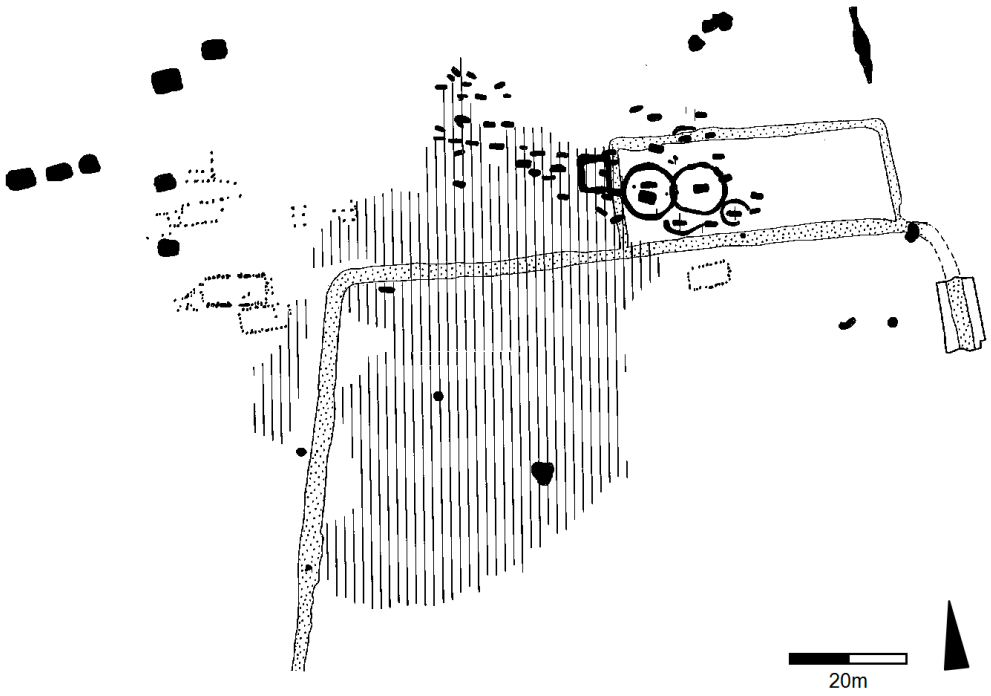
NO1:	**Sedgeford** (Chalkpit Field)
NGR:	TF 711 363
Main reference:	Davies 2008; Bates 1991
Zooarchaeology:	K. Poole
Archaeobotany:	V. Fryer
Elevation:	22
Geology:	Sand and gravel overlying degraded chalk.
Summary:	An earlier phase is dated by Ipswich Ware to the 8th-9th centuries; a subsequent phase, in which Ipswich and Thetford ware 'overlap', is thus dated to the mid-/late-9th century. Each phase includes ditches and an oven.

NO2:	**Witton**
NGR:	TG 336 320
Main reference:	Lawson 1983
Zooarchaeology:	n/a
Archaeobotany:	A.K.G. Jones
Elevation:	13
Geology:	Sands and gravels.
Summary:	SFBs, a post-built structure, pits and hearths, of perhaps 5th-6th century date. Pottery bears stamping, corrugation, rustication, and grooving.

NO3:	**North Elmham Park**
NGR:	TF 987 215
Main reference:	Wade-Martins 1980
Zooarchaeology:	B. Noddle
Archaeobotany:	H. Jarman
Elevation:	45
Geology:	Plateau gravel over the chalky boulder clay.
Summary:	Site with probable ecclesiastical associations; ditch systems, buildings with substantial foundation trenches, wells and pits. 8th-9th century dates are provided by Ipswich Ware, one sherd of Tating Ware, and dendrochronology of well timbers (AD 793-5).
Site plan:	After Wade-Martins 1980, p.38, fig.71.



NO4: **Spong Hill**
NGR: TF 981 195
Main reference: Rickett 1995
Zooarchaeology: J.M. Bond
Archaeobotany: P. Murphy
Elevation: 35
Geology: Gravels.
Summary: Six or seven SFBs, four 'posthole groups', pits and ditch and hollows. The ceramic assemblage, *c.*24% of which was decorated (incised and stamped), and with organic inclusions constituting the largest fabric group, could be consistent with occupation centred on the later 6th century.
Site plan: After Rickett 1995, p.41, fig.60.



NO5: **Terrington St. Clement**
NGR: TF 5386 1800
Main reference: Crowson *et al.* 2005
Zooarchaeology: P. Baker
Archaeobotany: P. Murphy
Elevation: 3
Geology: Silt roddon.
Summary: Pits, ditches/gullies, and a 'pond' dated by Ipswich Ware to the 8th-9th centuries. The larger ditches are thought to have served drainage purposes, while smaller ditches demarcated field boundaries and droveways.

NO6:	**Walpole St. Andrew**
NGR:	TF 4874 1600
Main reference:	Crowson *et al.* 2005
Zooarchaeology:	P. Baker
Archaeobotany:	P. Murphy
Elevation:	3
Geology:	Silt roddon.
Summary:	Pits and ditches/gullies dated by Ipswich Ware to the 8th-9th centuries.

NO7:	**Ingleborough** (West Walton)
NGR:	TF 4727 1481
Main reference:	Crowson *et al.* 2005
Zooarchaeology:	P. Baker
Archaeobotany:	P. Murphy
Elevation:	3
Geology:	Silt roddon.
Summary:	Pits, ditches/gullies and a hearth, dated by Ipswich Ware – plus a sherd of North French Blackware and one of possible Tating Ware – to the 8th-9th centuries.

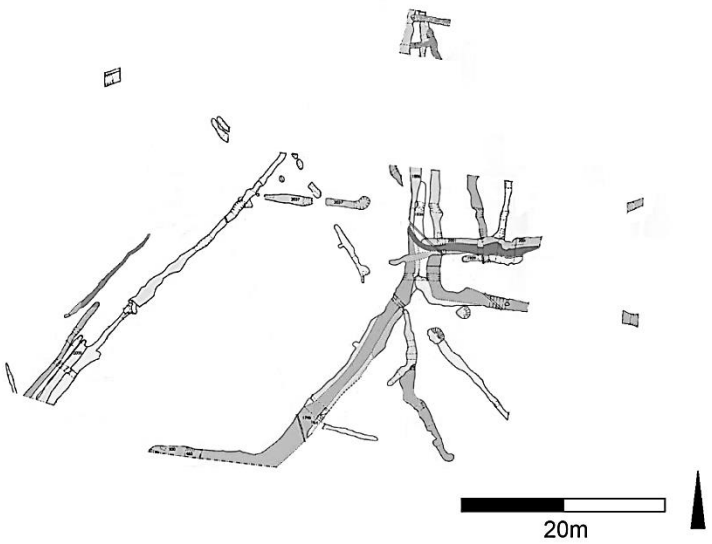
NO8:	**Marham** (Old Bell)
NGR:	TF 7084 0979
Main reference:	Newton 2010
Zooarchaeology:	J. Morris & S. Leach
Archaeobotany:	R. Scaife
Elevation:	11
Geology:	Spring line between Lower and Middle Chalk.
Summary:	Backfill of a SFB, which may be tentatively dated to the 9th century by the presence of Ipswich and Thetford-type ware, a bone comb of 9th century (or later) type, and a bun-shaped loomweight.

NO9:	**Bowthorpe** (Three Score)
NGR:	TG 1810 0910
Main reference:	Green 2008
Zooarchaeology:	J. Curl
Archaeobotany:	n/a
Elevation:	35
Geology:	Sands and gravel.
Summary:	Three SFBs and associated pits; occupation centred on the 6th century may be suggested by presence of seven decorated sherds (incised/grooved, S-shaped stamping) in the assemblage of handmade Saxon pottery.

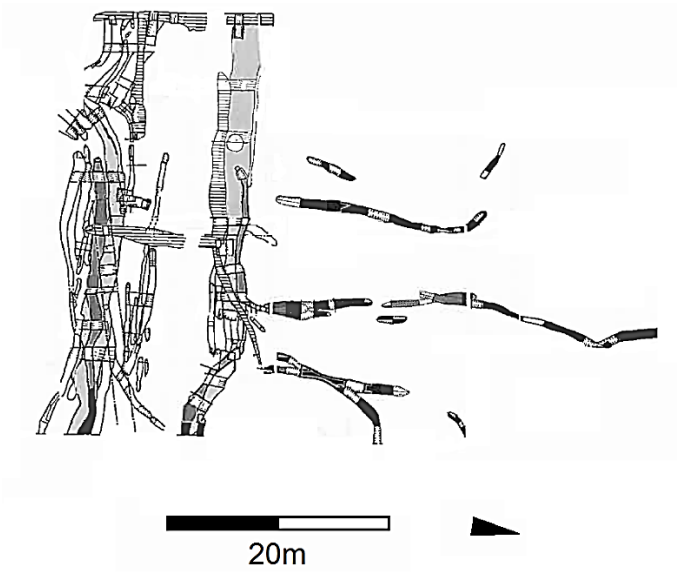
NO10: **Caister-on-Sea**
NGR: TG 5170 1230
Main reference: Darling & Gurney 1993
Zooarchaeology: M. Harman
Archaeobotany: n/a
Elevation: 11
Geology: Sands.
Summary: Hollow – 'Hut 1' – dated by Ipswich Ware to the 8th-9th centuries.

NO11: **Outwell** (Church Terrace)
NGR: TF 514 037
Main reference: Hall 2003
Zooarchaeology: n/a
Archaeobotany: V. Fryer
Elevation: 4
Geology: Clays, near margin between silt and peat fens.
Summary: A cut which may represent an earlier, wider course of the Nene; dated by ceramic assemblage of quartz- and organic-tempered pottery with incised patterns – of suggested late 5th/early 6th century date.

NO12: **Downham Market Bypass**
NGR: TF 6097 0211
Main reference: Percival 2001
Zooarchaeology: n/a
Archaeobotany: n/a
Elevation: 22
Geology: Sands and clays, near margin between silt and peat fens.
Summary: Sequence of pits and ditches, dated by Ipswich Ware to the 8th-9th centuries.
Site plan: After Percival 2001, fig.3.



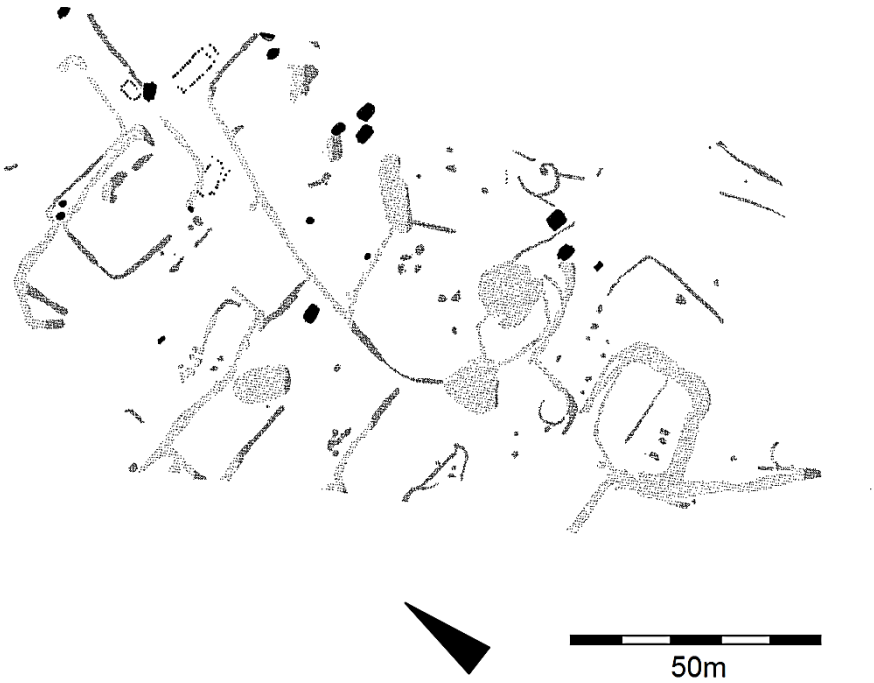
NO13: **London Road** (Downham Market)
NGR: TF 610 022
Main reference: Trimble 2001
Zooarchaeology: n/a
Archaeobotany: n/a
Elevation: 21
Geology: Sands and clays, near margin between silt and peat fens.
Summary: Sequence of ditches, dated by Ipswich Ware to the 8th-9th centuries.
Site plan: After Trimble 2001, fig.9.



NO14: **Wymondham** (Browick Road)
NGR: TG 124 015
Main reference: Ames 2005
Zooarchaeology: n/a
Archaeobotany: anonymous
Elevation: 41
Geology: Boulder clay plateau, thinly covered by windblown sand.
Summary: Hearth/oven and a probable SFB with pottery of 'Early/Mid Saxon' (6th-9th c.) date.

NO15: **Two Mile Bottom**
NGR: TL 852 868
Main reference: Bates & Lyons 2003
Zooarchaeology: n/a
Archaeobotany: P. Murphy
Elevation: 10
Geology: Sands and gravels.
Summary: Pits, ditches and a possible SFB. A 5th-7th/early 8th century date may be suggested by lack of Ipswich Ware in ceramic assemblage, along with the occurrence of Early Saxon indicators (scored decoration; applied boss and foot ring base).

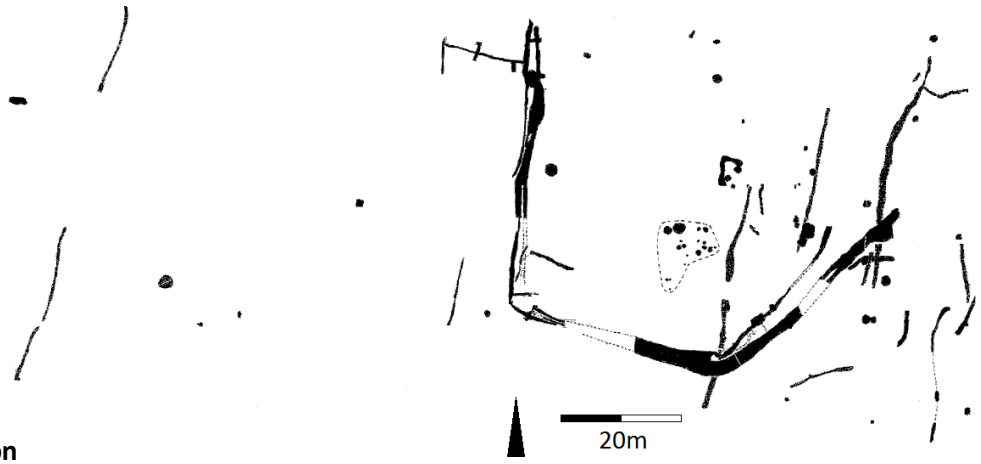
NO16: **Kilverstone**
NGR: TL 8840 8385
Main reference: Garrow *et al.* 2006
Zooarchaeology: L. Higbee
Archaeobotany: R. Ballantyne
Elevation: 17
Geology: Sand with flint nodules and patches of chalk.
Summary: At least 10 SFBs, four post-built structures, and pits occupying site of Romano-British settlement; 'Early Saxon' pottery, including stamped and incised decoration, would be consistent with activity centred on the 6th century. The environmental reports warn that residual Roman material may be present in Anglo-Saxon contexts.
Site plan: After Garrow *et al.* 2006, p.172, fig.5.2.



NO17:	**Brandon Road North** (Thetford)
NGR:	TL 855 832
Main reference:	Atkins & Connor 2010
Zooarchaeology:	I. Baxter
Archaeobotany:	V. Fryer
Elevation:	11
Geology:	Sands and gravels.
Summary:	Seven SFBs, ovens, pits, and a possible hall belong to an Early Saxon phase, centring on the late 5th/early 6th century (amongst decorated sherds, bossing and incision predominates over stamping). Subsequently, a large enclosure, post-built structure and more ovens were constructed in the 7th/8th-9th centuries (dated by Ipswich and Maxey-type wares).
Site plan:	Early Saxon phase after Atkins & Connor 2010, p.20, fig.9. Mid Saxon phase after Atkins & Connor 2010 p.30, fig.15.

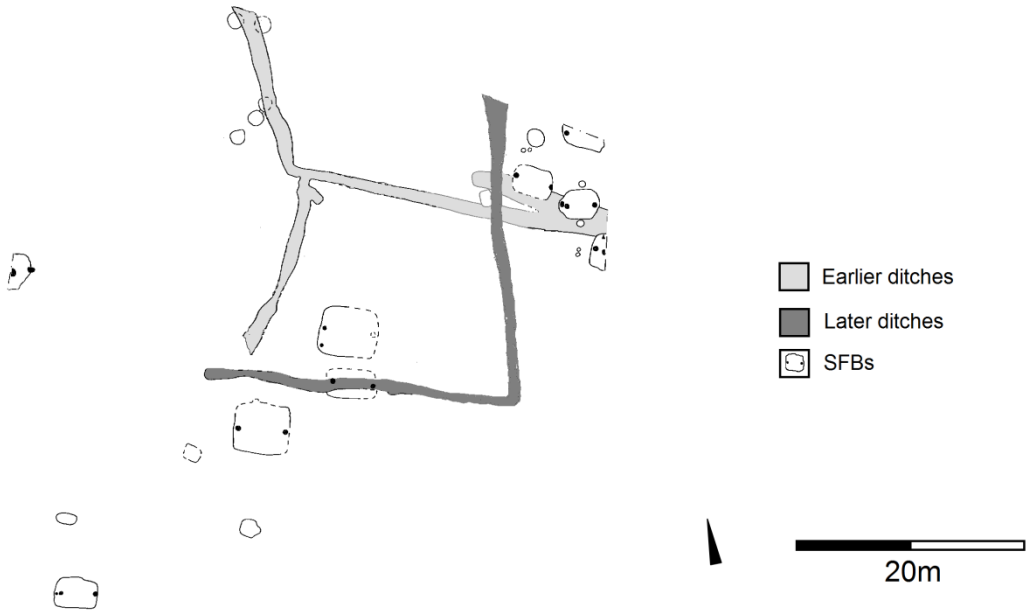


Early



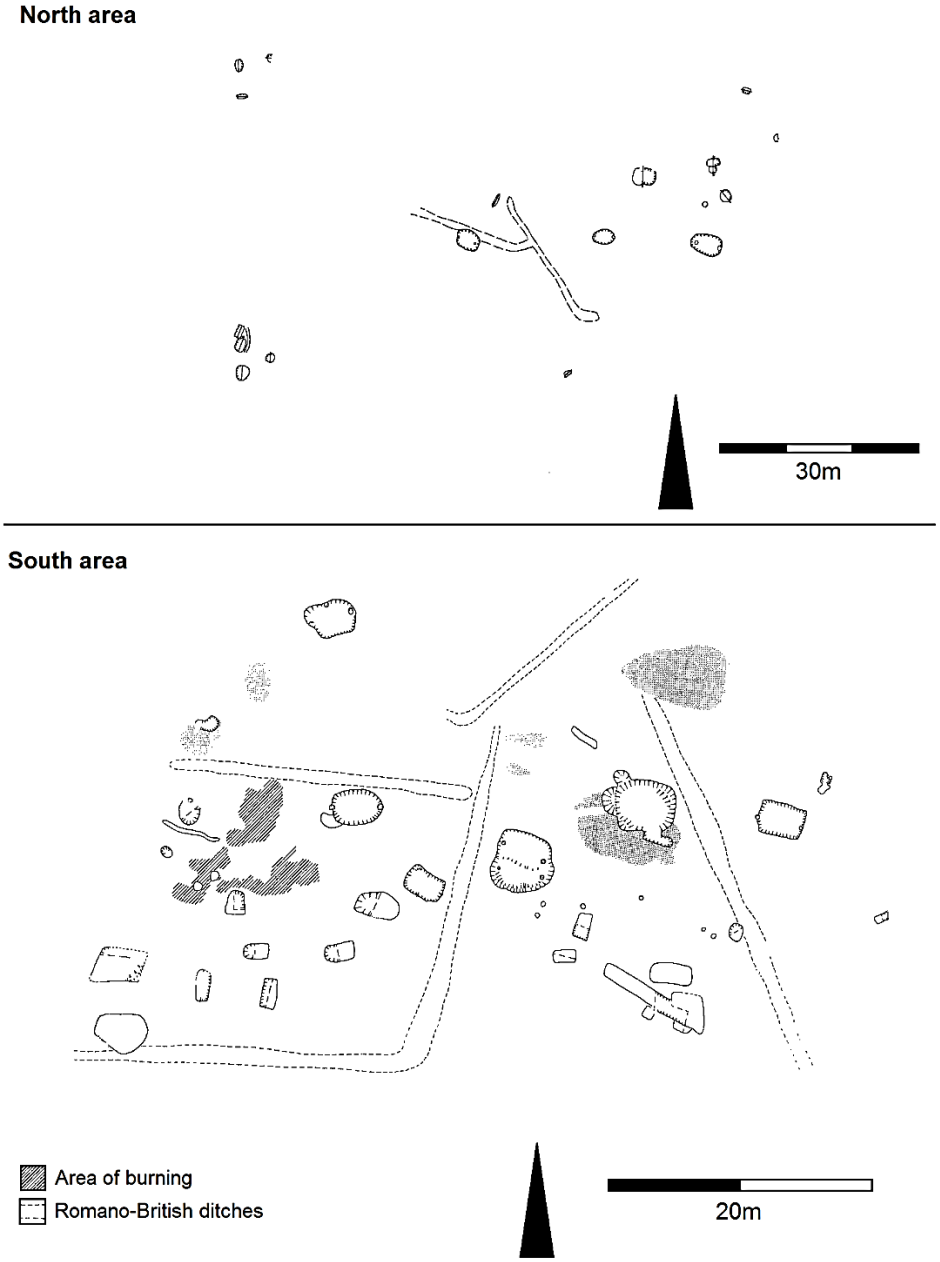
Mid Saxon

NO18: **Redcastle Furze** (Thetford)
NGR: TL 8615 8305
Main reference: Andrews 1995
Zooarchaeology: T. Wilson
Archaeobotany: P. Murphy
Elevation: 14
Geology: Sands and gravels.
Summary: SFBs, pits and ditches of an initial phase, followed by two shallow ditches of a subsequent phase. The first phase lacks Ipswich Ware but the rectilinear ditch system would be consistent more with a 7th century date than earlier. The second phase is dated by Ipswich Ware to the 8th-9th centuries.
Site plan: After Andrews 1995, p.12, fig.11.

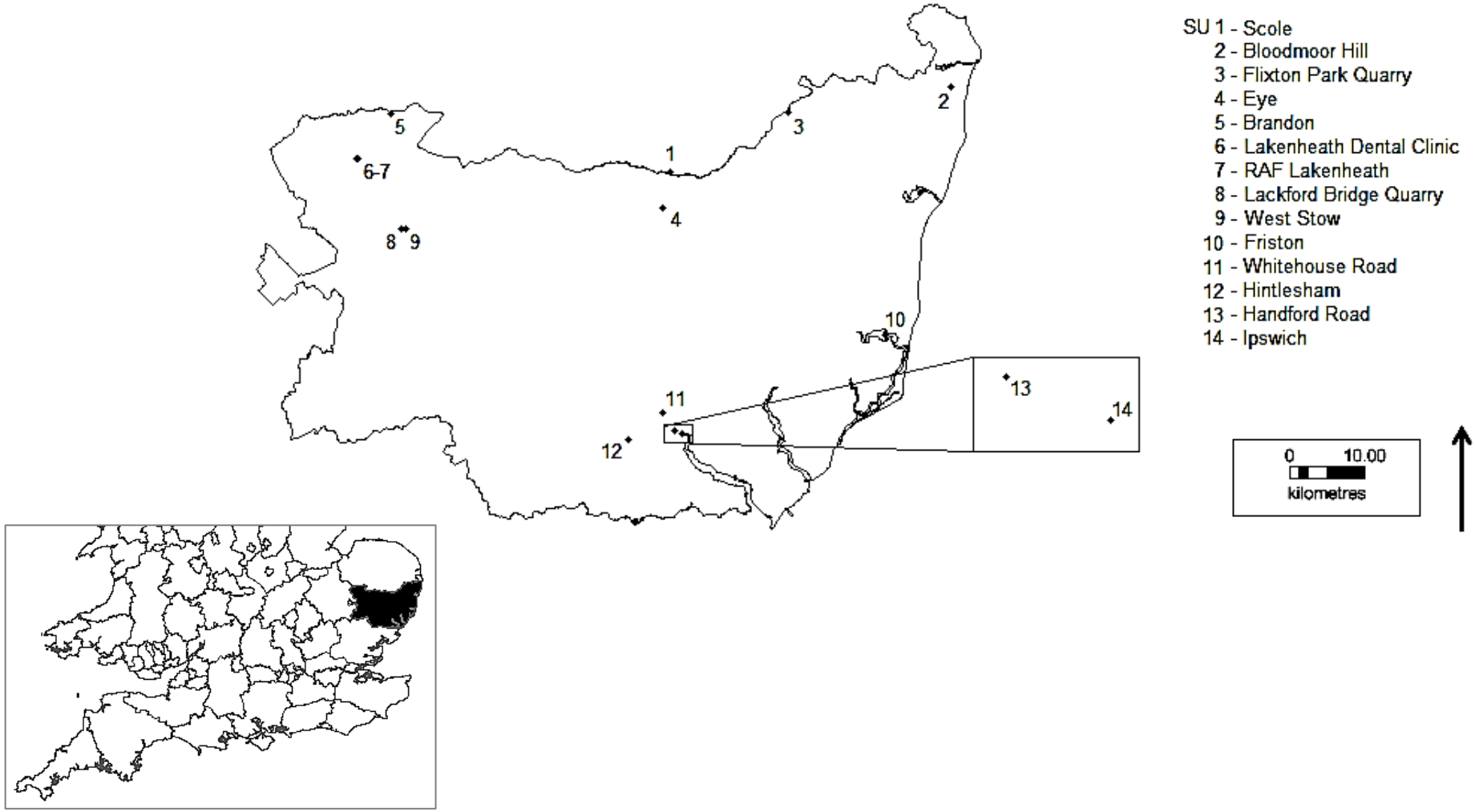


NO19: **Brandon Road South** (Thetford)
NGR: TL 863 830
Main reference: Dallas 1993
Zooarchaeology: G. Jones
Archaeobotany: n/a
Elevation: 14
Geology: River gravels.
Summary: At least six pits and possibly four SFBs. Various handmade wares in ceramic assemblages, including many burnished sherds, one bossed sherd, but no Ipswich Ware. Activity may therefore predate the 8th century, but further chronological precision is not available.

NO20: **Brettenham** (Melford Meadows)
NGR: TL 878 826
Main reference: Mudd 2002
Zooarchaeology: A. Powell & K.M. Clarke
Archaeobotany: M. Robinson
Elevation: 13
Geology: Low sandy terrace ridge above the Thet.
Summary: Scatter of eleven SFBs, pits, hollows and hearths. A 5th-6th century date is suggested by the ceramic specialist, noting the high proportion of sandy wares, and the occurrence of stamping, incised chevrons, a miniature biconical jar with slashed carination, and annular loomweights.
Site plan: After Mudd 2002, pp.54-55, fig.35-36.

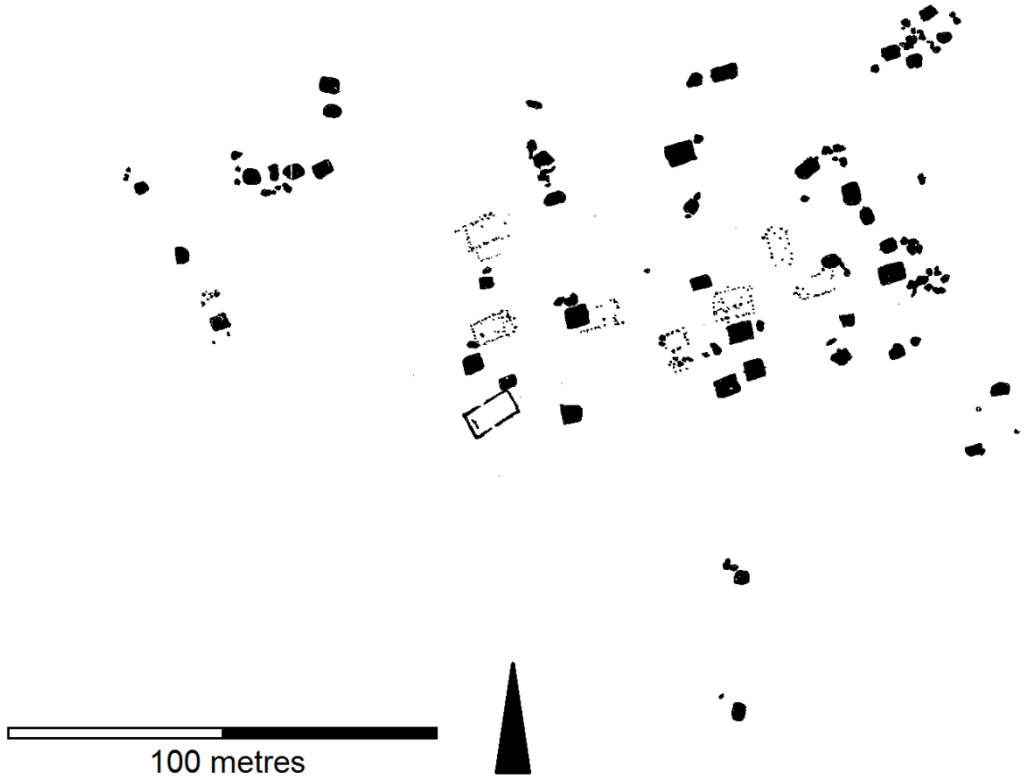


Suffolk

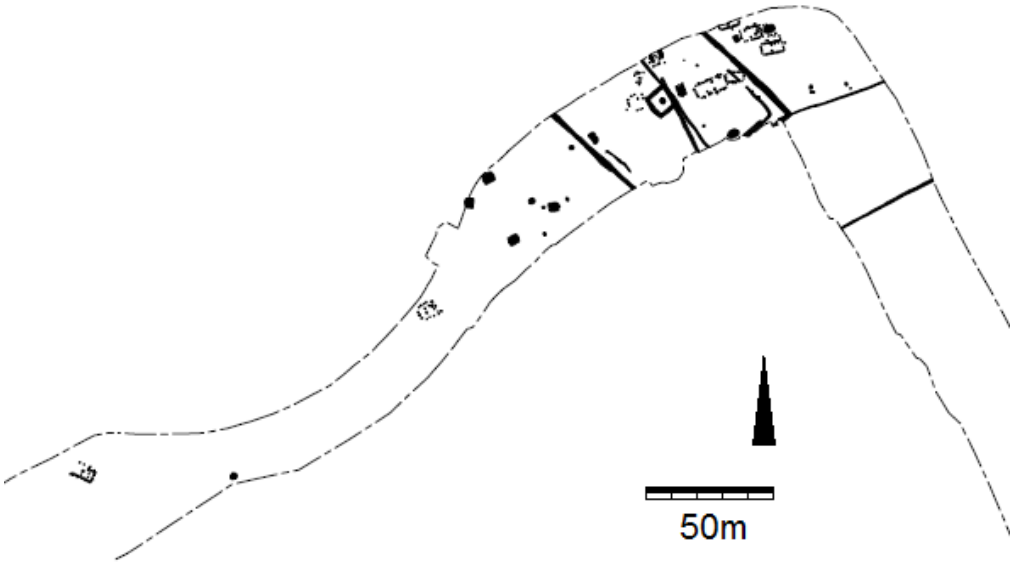

SU 1 - Scole
2 - Bloodmoor Hill
3 - Flixton Park Quarry
4 - Eye
5 - Brandon
6 - Lakenheath Dental Clinic
7 - RAF Lakenheath
8 - Lackford Bridge Quarry
9 - West Stow
10 - Friston
11 - Whitehouse Road
12 - Hintlesham
13 - Handford Road
14 - Ipswich
0
10.00
kilometres

SU1:	**Scole** (Oakley/Scole, Waveney valley)
NGR:	TM 147 786
Main reference:	Ashwin & Tester (in press).
Zooarchaeology:	n/a
Archaeobotany:	n/a
Elevation:	24
Geology:	Alluvium, sands and gravels in valley; boulder clay plateaux to north and south.
Note:	The excavated site falls partially within Norfolk, but the relevant data here fall within Suffolk.
Summary:	Two parallel alignments of oak piles along the edge of a palaeochannel in the Waveney valley, interpreted as a revetment or causeway. C14 dates from two piles fall within the 5th-7th centuries, while a third determination is of 4th-6th century date.

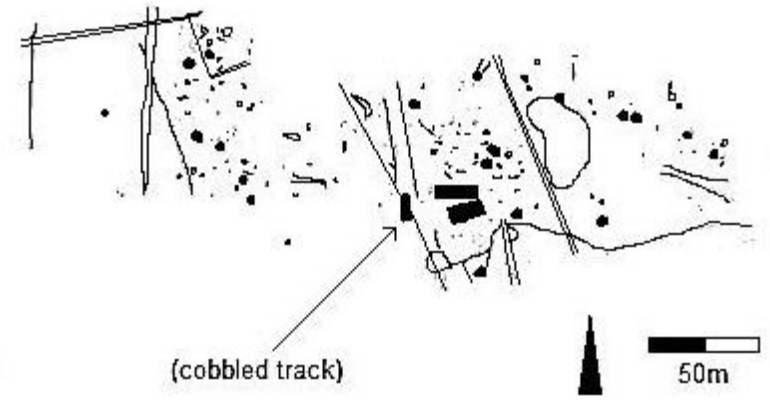
SU2: **Bloodmoor Hill** (Carlton Colville)
NGR: TM 5185 8995
Main reference: Lucy *et al.* 2009
Zooarchaeology: L. Higbee
Archaeobotany: R. Ballantyne
Elevation: 9
Geology: Sands, with clay ridge in vicinity.
Summary: 38 SFBs, at least 9 post-built structures, four possible middens, around 270 pits, and five hearth/oven bases. Occupation may span the late 5th to early 8th centuries. A developmental sequence is proposed, based upon ceramic, artefactual, and extensive radiocarbon dating: Phase 1 (AD 500-580), Phase 2a (AD 580-650), and Phase 2b (AD 650-700). Unfortunately, the features from which the botanical samples derive do not appear to have been closely dated within this sequence, and the faunal data are not sub-phased.
Site plan: After Lucy *et al.* 2009, pp.39, 103 & 122; figs.3.1, 3.40 & 3.54.



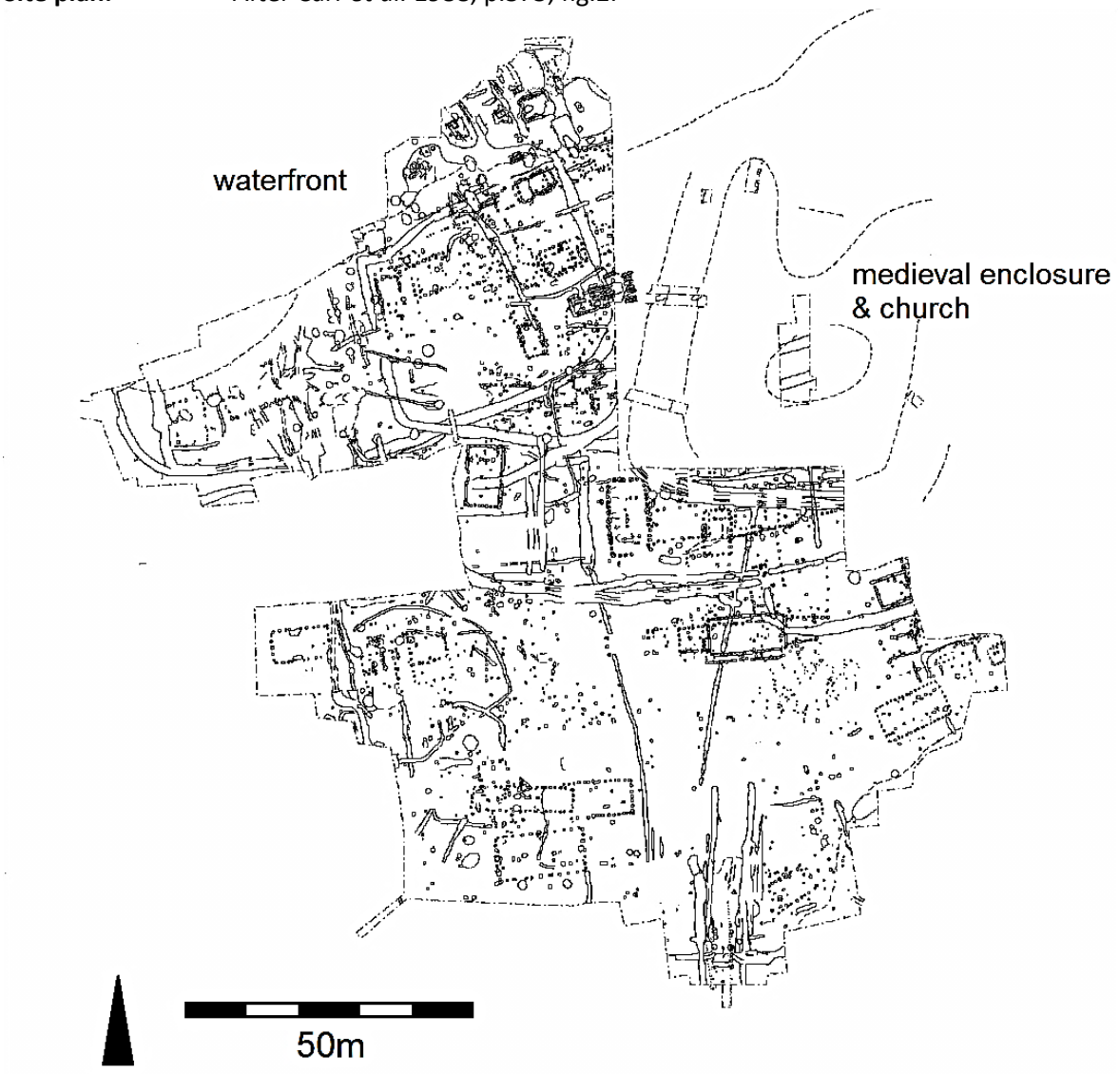
SU3: **Flixton** (Flixton Park Quarry)
NGR: TM 30370 86670
Main reference: Boulter 2008
Zooarchaeology: J. Curl
Archaeobotany: V. Fryer
Elevation: 17
Geology: River terrace gravels.
Summary: SFBs, post-built structures, pits, ditches and a putative shrine. Pottery decoration includes 5th and 7th century elements but is said to fit best with a 6th century date: incised/combed lines, stamping, stabbing, corrugation and finger-impression.
Site plan: After Boulter 2008, p.57, fig.38.



SU4: **Eye** (Hartismere High School)
NGR: TM 13800 74040
Main reference: Caruth 2008
Zooarchaeology: L. Higbee 2009
Archaeobotany: V. Fryer 2008
Elevation: 39
Geology: Heavy boulder clay, with gravel terraces along river valleys in vicinity.
Summary: 19 SFBs, two post-built structures, ditches, pits, layers and a cobbled track with wheel ruts. The settlement is described as being of Early Saxon date, but dating evidence was not available for reference at the time of writing.
Site plan: After Caruth 2008, p.519, fig.148.



SU5: **Brandon** (Staunch Meadow)
NGR: TL 778 864
Main reference: Carr *et al.* 1988
Zooarchaeology: P. Crabtree 2012
Archaeobotany: Murphy & Fryer 2009
Elevation: 6
Geology: Sand ridge surrounded by peat.
Summary: 34 post-built structures, fence lines, pits, ditches, hearths, church and cemetery. Dating evidence includes Ipswich Ware and *sceattas* (*c.*AD 720-760). Earlier activity is also suggested by a line of stakes at the south end of the site, C14-dated to cal.AD 540-650.
Site plan: After Carr *et al.* 1988, p.373, fig.2.



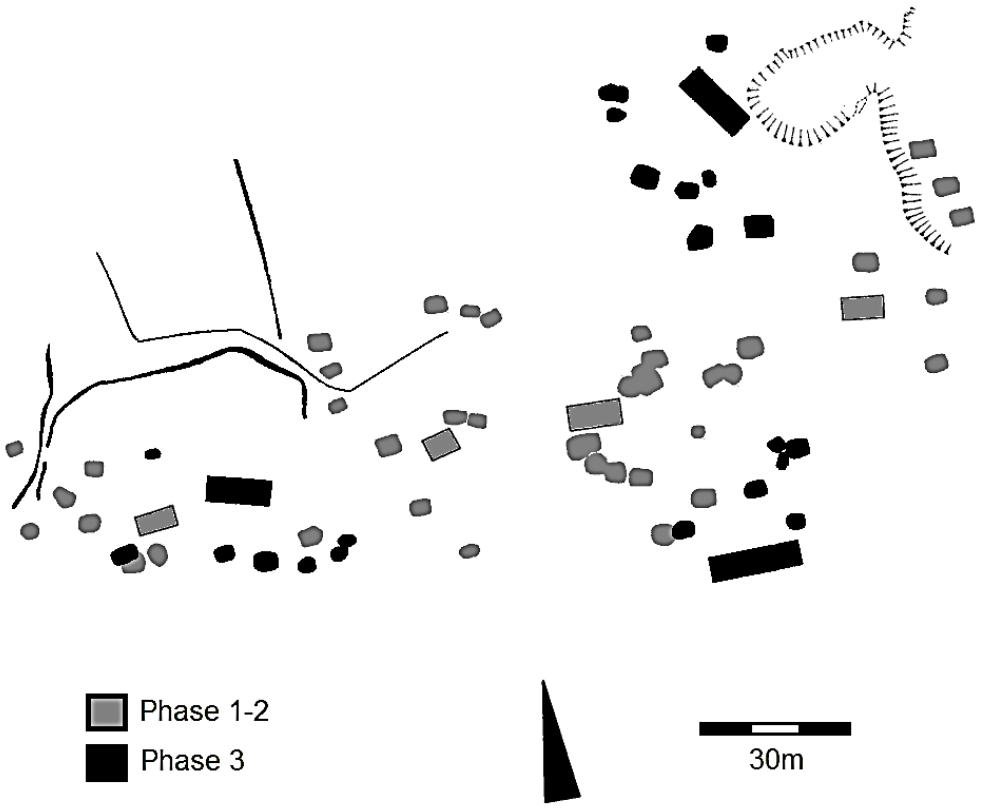
SU6:	**Lakenheath Dental Clinic**
NGR:	TL 7327 8050
Main reference:	Tester 2006
Zooarchaeology:	A. Willett
Archaeobotany:	n/a
Elevation:	10
Geology:	Fine Breckland sand.
Summary:	Three SFBs, ditch systems, wells, pits and postholes producing pottery of '6th-7th century' date, some bearing incised lines; the phase also produced a radiocarbon date of cal.AD 430-640 at 95% confidence. Further pits and ditches were dated by the Ipswich Ware to the 8th-9th centuries.
Site plan:	See **SU7**.

SU7:	**RAF Lakenheath**
NGR:	TL 7341 8046
Main reference:	Caruth 2006
Zooarchaeology:	J. Curl
Archaeobotany:	V. Fryer
Elevation:	10
Geology:	Fine Breckland sand.
Notes:	This site incorporates the Consolidated Support and Family Complexes excavations
Summary:	Ditches, pits, postholes and a soil layer dated by Ipswich Ware to 8th-9th centuries.
Site plan:	After Caruth 2006, p.73, fig.43: (A) 'ERL107' - not in project dataset, (B) Dental Clinic site, (C) Consolidated Support & Family Support Complexes.

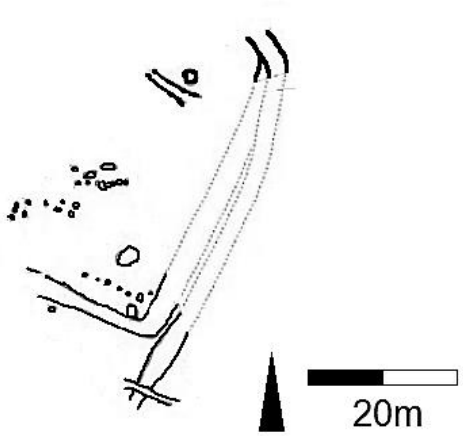


SU8: **Lackford Bridge Quarry**
NGR: TL 791 713
Main reference: Tipper 2007
Zooarchaeology: n/a
Archaeobotany: P. Murphy in West 1985
Elevation: 16
Geology: Sands and gravels.
Summary: 1 post-built structure, two SFBs, and pits/postholes. Botanical samples derive from pits and a SFB. The SFB is not closely datable within the Early/Mid Saxon period, whereas one of the pits contained charcoal C14-dated to cal.AD 640-900 (at 95% confidence).

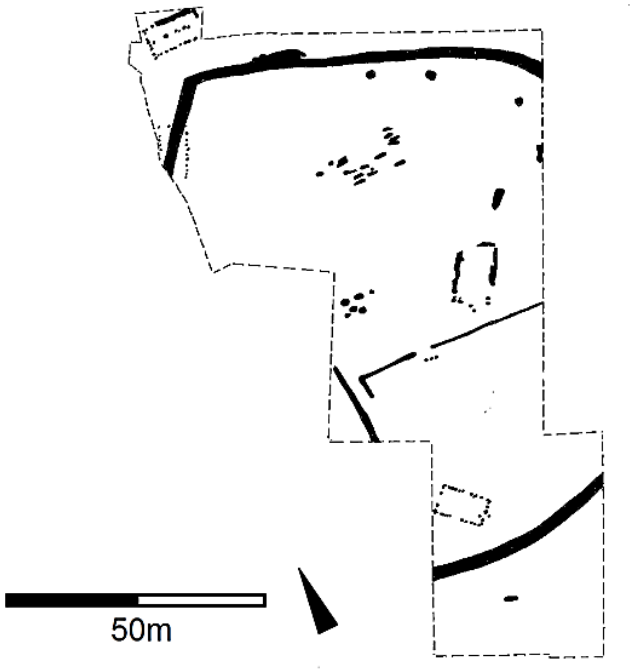
SU9: **West Stow**
NGR: TL 7970 7135
Main reference: West 1985
Zooarchaeology: P. Crabtree 1989; 2012
Archaeobotany: P. Murphy
Elevation: 16
Geology: Sands and gravels, with patches of brickearth, in Lark valley.
Summary: SFBs, post-built structures, postholes, pits and hollows. The SFBs are divided into three phases on stratigraphic and artefactual grounds, corresponding broadly to the 5th-6th, 6-7th and 7th-early 8th centuries respectively; ditch systems belong to the latter phase.
Site plan: After West 1985, vol.2, fig.7.



SU10: **Friston** (Barber's Point)
NGR: TM 4321 5729
Main reference: Meredith 2007
Zooarchaeology: n/a
Archaeobotany: n/a
Elevation: 4
Geology: Complex series of sands, gravels and clays.
Summary: Ditch systems and post-built structures, dated by Ipswich Ware and North French Blackware to the 8th-9th centuries.
Site plan: After Meredith 2007, p.48, fig.14A.

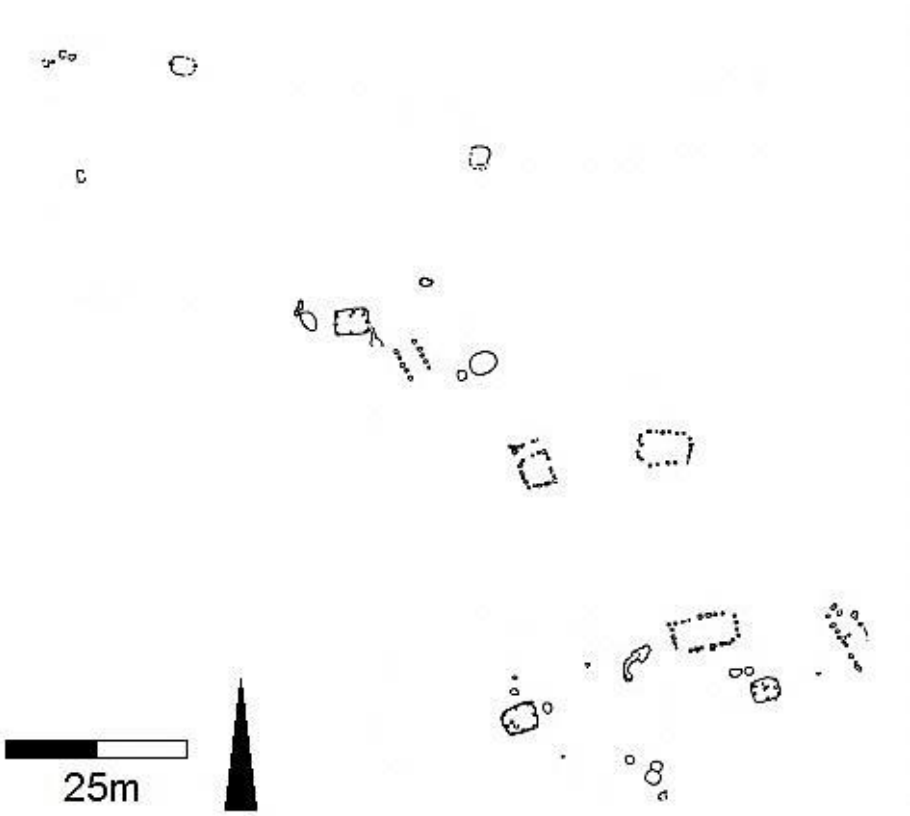


SU11: **Whitehouse Road** (Bramford, Ipswich)
NGR: TM 138 470
Main reference: Caruth 1996
Zooarchaeology: n/a
Archaeobotany: Fryer & Murphy 1996
Elevation: 30
Geology: Clay, sands and gravels.
Summary: Pits, post-hole buildings and a cemetery, all within enclosure ditches. Only interim reports were available at the time of writing, but occupation is believed to span the Mid and Late Saxon periods, beginning in the 8th century (dated by two *sceattas*).
Site plan: After Reynolds 2003, p.113, fig.6E.



SU12: **Hintlesham** (Silver Birches, Silver Hill)
NGR: TM 0925 4340
Main reference: Boulter 2010
Zooarchaeology: n/a
Archaeobotany: V. Fryer
Elevation: 46
Geology: Sand and clay.
Summary: 8th-9th century ditch dated by Ipswich Ware.

SU13: **Handford Road** (Ipswich)
NGR: TM 1530 4455
Main reference: Boulter 2005
Zooarchaeology: J. Curl
Archaeobotany: V. Fryer
Elevation: 5
Geology: Sands and gravels.
Summary: 5 SFBs, at least three post-built structures, postholes, pits and an oven. A 5th–6th century chronology is preferred in the available report, based upon the lack of organic-tempered and Ipswich Ware pottery, and the occurrence of several stamped, incised and bossed sherds.
Site plan: After Boulter 2005, p.23, fig.8.

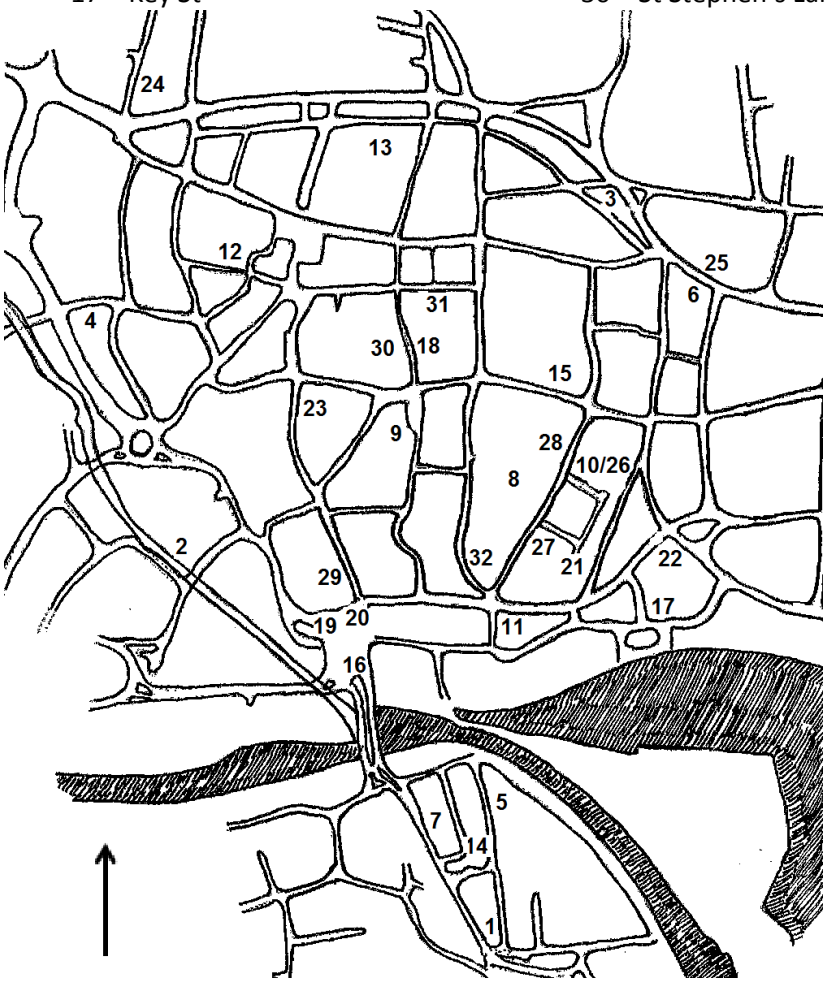


SU14: **Ipswich**
NGR: TM 162 441
Main reference: Largely unpublished, but Scull 2009 pp.313–319 summarises current interpretations.
Zooarchaeology: P. Crabtree 2012
Archaeobotany: P. Murphy 2004
Elevation: 15
Geology: Clay, sands and gravels.
Summary: Series of rescue excavations, 1974-1988, representing the Mid Saxon '*wic.*' One botanical sample derives from a ditch of late 6th/7th century date; otherwise, 7th-9th century dates apply.
Site plan: Excavation plans not available; distribution of sites within modern Ipswich, below, is after Crabtree 2012, p.6, fig.1.4. Scale not given.

Key:

*faunal data only
**botanical data only
*** both

7 – Vernon St**
8 – Lower Brook St**
9 – Turret Lane**
11 – Foundation St/Star Ln***
13 – Tower Ramparts***
14 – Little Whip St***
16 – Bridge St*
17 – Key St***
20 – St Peter's St/Greyfriars Rd***
21 – Shire Hall Yard***
22 – Fore St**
26 – School St/Foundation St***
27 – Smart St/Foundation St **
28 – Wingfield St/Foundation St***
29 – Greyfriars Rd***
30 – St Stephen's Lane*



Appendix 2: Concordance of Archaeobotanical Samples

Notes

- All stated volumes are measured in litres.
- Ch = charred, W = waterlogged, M = mineralized, CI = ceramic impression

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
AC1	Burghfield	other	Generic	-	-	9 samples	Ch/W	assemblage only
AL1	Alchester	ditch	Early	5	5124	70	Ch	
ALP1	Eaton Socon	SFB	Early	20	1256	13	Ch	
ALP2	Eaton Socon	posthole	Early	10	1297	15	Ch	
BBP1	Pampisford	SFB	Intermediate	8	447	3	Ch	
BC1	Bancroft	ditch	Early	-	94/95	-	Ch	
BCF1	Barton Court Farm	pit	Early	20	1174	-	Ch	
BCF2	Barton Court Farm	SFB	Early	10	1190	-	Ch	
BCF3	Barton Court Farm	well	Early	-	1083	2	W	
BCF4	Barton Court Farm	well	Early	-	1083	4	W	
BCL1	Bishop's Cleeve	ditch	Intermediate	30	1246	14	Ch	
BCL2	Bishop's Cleeve	ditch	Intermediate	15	2238	21	Ch	
BCL3	Bishop's Cleeve	ditch	Intermediate	30	1257	12	Ch	
BEL1-12	Marham	SFB	Mid	-	2034	9, 10, 13, 20, 21, 24, 28, 29, 31, 32, 33, 35	Ch	
BEL13+20	Marham	hearth/oven	Mid	-	2107	45 & 89	Ch	
BEL14-19	Marham	SFB	Mid	-	2108	46-51	Ch	
BFD1	Dumbleton	ditch	Generic	40	1540 (Ditch 1541)	1068	Ch	
BH1	Barrow Hills	ditch	Early	28.5	601/5/2		Ch	interdependent?
BH2	Barrow Hills	ditch	Early	0.75	601/5/3	-	Ch	interdependent?
BH3	Barrow Hills	SFB	Early	15	1005D/2	-	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
BH4	Barrow Hills	SFB	Early	10	1053/B/2	-	Ch	interdependent?
BH5	Barrow Hills	SFB	Early	10	1053/D/2	-	Ch	interdependent?
BH6	Barrow Hills	SFB	Early	11	1061/A/2	-	Ch	
BH7	Barrow Hills	SFB	Early	10	1105/B/4	-	Ch	
BH8	Barrow Hills	SFB	Early	10	2143/B	-	Ch	
BH9	Barrow Hills	SFB	Early	12	1225/B/1	-	Ch	
BH10	Barrow Hills	SFB	Early	11	1225/D/1		Ch	
BH11	Barrow Hills	SFB	Early	10	1297/B/4		Ch	interdependent?
BH12	Barrow Hills	SFB	Early	10	1297/D/4	-	Ch	interdependent?
BH13	Barrow Hills	SFB	Early	10	3606/D/3	-	Ch	interdependent?
BH14	Barrow Hills	SFB	Early	10	3606/B/2	-	Ch	interdependent?
BH15	Barrow Hills	SFB	Early	10	3607/D/1	-	Ch	
BH16	Barrow Hills	SFB	Early	10	3608/L/2	-	Ch	
BH17	Barrow Hills	SFB	Early	1.5	3805/B/3	-	Ch	interdependent?
BH18	Barrow Hills	SFB	Early	1.5	3805/D/3	-	Ch	interdependent?
BH19	Barrow Hills	SFB	Early	2.5	3811/D/1	-	Ch	
BH20	Barrow Hills	SFB	Early	10	4198/D/2	-	Ch	
BMH1	Bloodmoor Hill	posthole	Generic	30	4519	617	Ch	
BMH2	Bloodmoor Hill	posthole	Generic	40	4520	618	Ch	
BMH3	Bloodmoor Hill	posthole	Generic	20	4529	619	Ch	
BMH4	Bloodmoor Hill	posthole	Generic	4	4538	620	Ch	
BMH5	Bloodmoor Hill	posthole	Generic	10	4545	623	Ch	
BMH6	Bloodmoor Hill	posthole	Generic	10	4553	626	Ch	
BMH7	Bloodmoor Hill	posthole	Generic	10	4555	627	Ch	
BMH8	Bloodmoor Hill	posthole	Generic	10	4556	628	Ch	
BMH9	Bloodmoor Hill	posthole	Generic	10	4534	629	Ch	
BMH10	Bloodmoor Hill	posthole	Generic	4	4570	630	Ch	
BMH11	Bloodmoor Hill	pit	Generic	2	3469	534	Ch	
BMH12	Bloodmoor Hill	pit	Generic	5	3460	551	Ch	
BMH13	Bloodmoor Hill	pit	Generic	5.5	3536	552	Ch	
BMH14	Bloodmoor Hill	pit	Generic	10	4600	647	Ch	
BMH15	Bloodmoor Hill	pit	Generic	20	4604	649	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
BON1	Wittering	other	Mid	-	1003	-	Ch	
BON2	Wittering	other	Mid	-	1007	-	Ch	
BON3	Wittering	pit	Mid	-	1013	-	Ch	
BRT1	Brandon Road North	SFB	Early	-	2206	3	Ch	
BRT2	Brandon Road North	well	Early	-	1280	46	Ch	
BRT3	Brandon Road North	pit	Mid	-	278	7	Ch	
BRT4	Brandon Road North	other	Mid	-	2315	47	Ch	
BSH1	Bishop's Court	well	Early	-	-	-	W	
BTT1	St Aldate's - BT Tunnel	other	Intermediate	-	layer 9	3	W	
BTT2	St Aldate's - BT Tunnel	other	Intermediate	-	layer 110	13	W	
CD1	Collingbourne Ducis	SFB	Mid	-	217, 337	-	Ch	
CD2	Collingbourne Ducis	SFB	Mid	-	217, 268	-	Ch	
CD3	Collingbourne Ducis	SFB	Mid	-	217, 273	-	Ch	
CD4	Collingbourne Ducis	SFB	Mid	-	222, 272	-	Ch	
CD5	Collingbourne Ducis	SFB	Mid	-	329, 385	-	Ch	
CD6	Collingbourne Ducis	SFB	Early	-	220, 270	-	Ch	interdependent?
CD7	Collingbourne Ducis	SFB	Early	-	220, 279	-	Ch	interdependent?
CD8	Collingbourne Ducis	SFB	Early	-	307, 359	-	Ch	
CD9	Collingbourne Ducis	SFB	Mid	-	304, 357	-	Ch	
CD10	Collingbourne Ducis	SFB	Mid	-	312, 363	-	Ch	
CD11	Collingbourne Ducis	SFB	Mid	-	318, 369	-	Ch	
CD12	Collingbourne Ducis	SFB	Mid	-	321, 273	-	Ch	
CD13	Collingbourne Ducis	SFB	Mid	-	333, 388	-	Ch	interdependent?
CD14	Collingbourne Ducis	SFB	Mid	-	333, 399	-	Ch	interdependent?
CD15	Collingbourne Ducis	SFB	Mid	-	341, 398	-	Ch	
CD16	Collingbourne Ducis	SFB	Mid	-	340, 470	-	Ch	
CD17	Collingbourne Ducis	SFB	Mid	-	349, 467	-	Ch	
CD18	Collingbourne Ducis	other	Mid	-	511, 554	-	Ch	interdependent?
CD19	Collingbourne Ducis	other	Mid	-	511, 556	-	Ch	interdependent?
CD20	Collingbourne Ducis	other	Mid	-	200, 250	-	Ch	
CD21	Collingbourne Ducis	other	Mid	-	202, 252	-	Ch	
CD22	Collingbourne Ducis	other	Mid	-	203, 254	-	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
CD23	Collingbourne Ducis	other	Mid	-	206, 258	-	Ch	
CD24	Collingbourne Ducis	other	Mid	-	336, 392	-	Ch	
CF1	Cresswell Field	SFB	Mid	37	7311	7024	Ch	
CF2	Cresswell Field	SFB	Mid	37	7312	7025	Ch	
CF3	Cresswell Field	SFB	Mid	47	7841	7030/1	Ch	
CF4	Cresswell Field	SFB	Mid	37	8556	7102	Ch	
CHG1	Childerley Gate	other	Sub-Roman	10	group 7.4	5023 (sub-group 45.4)	Ch	
CHG2	Childerley Gate	other	Sub-Roman	10	group 14.2	5037 (sub-group 86.2)	Ch	
CHG3	Childerley Gate	other	Sub-Roman	10	group 14.2	5034 (sub-group 88.2)	Ch	
CHM1-3	Chadwell St Mary	SFB	Intermediate	45	17	1-3	Ch	
CHM4-5	Chadwell St Mary	SFB	Intermediate	30	12	6-7	Ch	
CHM6-7	Chadwell St Mary	SFB	Intermediate	30	13	8-9	Ch	
CHM8-9	Chadwell St Mary	SFB	Intermediate	30	19	10-11	Ch	
CHM10	Chadwell St Mary	SFB	Intermediate	15	21	12	Ch	
CHM11	Chadwell St Mary	SFB	Intermediate	15	34	13	Ch	
CHN1	Hungerford	SFB	Generic	4	SFB 5001	5081	Ch	
CHO1	Cherry Orton Road	SFB	Intermediate	30	F.94 [95]	-	Ch	
CHV1	Chieveley	pit	Generic	40	29218	20	Ch	
CHV2	Chieveley	pit	Generic	20	1003	2	Ch	
CHV3	Chieveley	pit	Generic	20	1010	3	Ch	
CHV4	Chieveley	pit	Generic	20	1018	4	Ch	
COG1	Cogges	posthole	Early	-	141	-	Ch	
COG2	Cogges	SFB	Early	-	146	-	Ch	
COG3	Cogges	posthole	Early	-	148	-	Ch	
COG4	Cogges	posthole	Early	-	152	-	Ch	
CPS1	Sedgeford	ditch	Mid	10	202	-	Ch	
CPS2	Sedgeford	ditch	Mid	10	210	-	Ch	
CPS3	Sedgeford	ditch	Mid	10	230	-	Ch	
CPS4	Sedgeford	ditch	Mid	10	412	-	Ch	
CPS5	Sedgeford	pit	Mid	10	509	-	Ch	
CPS6	Sedgeford	ditch	Mid	20	308	-	Ch	
CPS7	Sedgeford	ditch	Mid	20	310	-	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
CPS8	Sedgeford	hearth/oven	Mid	20	311	-	Ch	
CPS9	Sedgeford	hearth/oven	Mid	20	312	-	Ch	
CPS10	Sedgeford	hearth/oven	Mid	5	315	-	Ch	
CR1	Lower Slaughter	ditch	Mid	30	1081	1	Ch	
CR2	Lower Slaughter	ditch	Mid	30	319	6	Ch	
CR3	Lower Slaughter	ditch	Mid	30	323	8	Ch	
CR4	Lower Slaughter	ditch	Mid	30	130	4	Ch	
CR5	Lower Slaughter	ditch	Mid	30	079	7	Ch	
CR6	Lower Slaughter	ditch	Mid	30	343	9	Ch	
CR7	Lower Slaughter	ditch	Mid	30	272	5	Ch	
CR8	Lower Slaughter	ditch	Mid	30	049	3	Ch	
CRM1	Criminology Site	pit	Early	7	10	1	Ch	
CRM2	Criminology Site	posthole	Early	1	66	3	Ch	
CRM3	Criminology Site	pit	Early	2	60	4	Ch	
CRM4	Criminology Site	SFB	Early	4	123	5	Ch	
CSE1	Chiefs Street	well	Mid	-	104, 102	4	Ch	
CSE2	Chiefs Street	well	Mid	-	100, 97	5	Ch	
DEW1	Waterbeach	pit	Early	15	12	13	Ch	
DEW2	Waterbeach	pit	Early	15	8	1	Ch	
DEW3	Waterbeach	pit	Early	15	18	8	Ch	
DEW4	Waterbeach	pit	Early	15	23	9	Ch	
DEW5	Waterbeach	pit	Early	15	14	6	Ch	
EN1	Eynsham	pit	Intermediate	10	394	86	Ch	
EN2	Eynsham	posthole	Intermediate	0.5	1984	176	Ch	
EN3	Eynsham	posthole	Intermediate	1	3011	177	Ch	
ENB1	Eynesbury	pit	Early	10	4605	1560	Ch	
ENB2	Eynesbury	pit	Early	10	4606	1562	Ch	
ENB3	Eynesbury	SFB	Early	30	7201	9501	Ch	
ENB4	Eynesbury	SFB	Early	30	8617	9505	Ch	
ENB5	Eynesbury	posthole	Early	10	8612	9506	Ch	
ENB6	Eynesbury	pit	Early	1	7406	9514	Ch	
FLX1	Flixton	SFB	Early	10	276	548	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
FLX2	Flixton	SFB	Early	8	591	592	Ch	
FLX3	Flixton	SFB	Early	16	278	555	Ch	
FLX4	Flixton	SFB	Early	16	605	685	Ch	
FLX5	Flixton	SFB	Early	16	1120	1125	Ch	
FLX6-7	Flixton	SFB	Early	16	1501	1506 & 1520	Ch	
FLX8-9	Flixton	pit	Early	16	604	610 & 746	Ch	
FLX10	Flixton	pit	Early	16	785	786	Ch	
FLX11	Flixton	pit	Early	8	846	847	Ch	
FLX12	Flixton	pit	Early	8	857	858	Ch	
FLX13-14	Flixton	pit	Early	16	1121	1144 & 1153	Ch	
FLX15	Flixton	pit	Early	8	1343	1344	Ch	
FLX16	Flixton	pit	Early	8	1461	1462	Ch	
FLX17	Flixton	posthole	Early	8	226	227	Ch	
FLX18	Flixton	posthole	Early	8	304	305	Ch	
FLX19	Flixton	posthole	Early	8	344	345	Ch	
FLX20	Flixton	posthole	Early	8	631	632	Ch	
FLX21	Flixton	posthole	Early	8	702	703	Ch	
FLX22	Flixton	posthole	Early	8	653	356	Ch	
FLX23	Flixton	posthole	Early	8	374	375	Ch	
FLX24	Flixton	posthole	Early	8	402	403	Ch	
FLX25	Flixton	posthole	Early	8	908	910	Ch	
FLX26	Flixton	posthole	Early	8	1241	1242	Ch	
FLX27	Flixton	posthole	Early	8	1243	1244	Ch	
FLX28	Flixton	posthole	Early	8	1255	1255	Ch	
FLX29	Flixton	posthole	Early	8	1351	1352	Ch	
FLX30	Flixton	posthole	Early	8	1361	1362	Ch	
FLX31	Flixton	ditch	Early	16	314	315	Ch	
FLX32	Flixton	ditch	Early	16	314	687	Ch	
FLX33	Flixton	ditch	Early	16	318	319	Ch	
FOR1	Forbury House	pit	Mid	20	53	1	Ch	
GAM1	Gamlingay	SFB	Intermediate	30	2077	17	Ch	
GAM2	Gamlingay	pit	Intermediate	30	2402	56	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
GAM3	Gamlingay	SFB	Intermediate	30	2525	72	Ch	
GAM4	Gamlingay	SFB	Intermediate	30	2562	76	Ch	
GAM5	Gamlingay	ditch	Mid	50	2648	78	Ch	
GF1	Goring	other	Early	10	421	-	Ch	
GL1	Great Linford	other	Generic	2	55	-	Ch	assemblage only
GMC1	Godmanchester	other	Mid	-	2477	21	Ch	
GMC2	Godmanchester	other	Mid	-	2610	23	Ch	
GMC3	Godmanchester	other	Mid	-	2741	24	Ch	
GMC4	Godmanchester	SFB	Mid	-	2672	26	Ch	
GMC5	Godmanchester	SFB	Mid	-	2703	28	Ch	
GMC6	Godmanchester	SFB	Mid	-	2538	30	Ch	
GMC7	Godmanchester	SFB	Mid	-	2540	33	Ch	
GMC8	Godmanchester	SFB	Mid	-	2705	35	Ch	
H1	Hartigans	well	Early	-	152	-	W	
HAM1	Harston Mill	ditch	Generic	20	F2097, L2104	1	Ch	
HAM2	Harston Mill	pit	Mid	20	F2197, L2199	3	Ch	
HAM3	Harston Mill	pit	Generic	20	F2386, L2388	5	Ch	
HAM4	Harston Mill	pit	Generic	20	F2544, L2527	6	Ch	
HAM5	Harston Mill	pit	Generic	20	F2530, L2531	4	Ch	
HAM6-7	Harston Mill	pit	Generic	40	F2555, L2556	7A-7B	Ch	
HAM8	Harston Mill	pit	Mid	20	F2663, L2665	10	Ch	
HAM9	Harston Mill	pit	Mid	20	F3283, L3325	18	Ch	
HAM10	Harston Mill	pit	Mid	20	F3516, L3517	13	Ch	
HAM11	Harston Mill	pit	Mid	20	F3549, L3565	14	Ch	
HAM12	Harston Mill	pit	Generic	20	F3588, L3589	15	Ch	
HAM13	Harston Mill	ditch	Mid	20	F3752, L3754	82	Ch	
HAM14	Harston Mill	ditch	Generic	20	F3755, L3758	83	Ch	
HAM15	Harston Mill	pit	Mid	20	F4082, L4088	35	Ch	
HAM16-17	Harston Mill	SFB	Early	40	F4183, L4184	41 & 51	Ch	
HAM18-20	Harston Mill	SFB	Early	60	F4529, L4530	64-66	Ch	
HAM21	Harston Mill	pit	Generic	20	F4652, L4653	27	Ch	
HAM22	Harston Mill	pit	Generic	20	F4652, L4677	29	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
HAM23	Harston Mill	pit	Mid	20	F4662, L4663	30	Ch	
HAM24	Harston Mill	pit	Generic	20	F4726, L4727	34	Ch	
HAM25	Harston Mill	posthole	Early	20	F4430, L4431	69	Ch	
HAM26	Harston Mill	pit	Mid	20	F4692, L4697	31	Ch	
HAM27	Harston Mill	pit	Generic	20	F4818, L4819	42	Ch	
HAM28	Harston Mill	pit	Generic	20	F4895, L4895	46	Ch	
HAM29-31	Harston Mill	SFB	Early	60	F4932, L4933	57, 59-60	Ch	
HAM32	Harston Mill	pit	Mid	20	F5435, L5436	93	Ch	
HAM33	Harston Mill	pit	Generic	20	F5399, L5460	94	Ch	
HAM34	Harston Mill	pit	Generic	20	F5742, L5743	97	Ch	
HAM35	Harston Mill	SFB	Early	20	F5870, L6086	138	Ch	
HAM36	Harston Mill	pit	Generic	20	F5828, L5844	102	Ch	
HAM37-40	Harston Mill	SFB	Early	80	F5870, L5871	111, 116, 118-9	Ch	
HDI1-12	Handford Road	SFB	Early	384	SFB 0699	707-710, 754-757 , 918, 2065, 2181, 2405	Ch	
HDI13-22	Handford Road	SFB	Early	320	SFB 3001	3004, 3019, 3062, 3066-7, 3103, 3202, 3234, 3227-8	Ch	
HDI23	Handford Road	posthole	Early	16	SFB 3001	3207	Ch	interdependent?
HDI24	Handford Road	posthole	Early	16	SFB 3001	3259	Ch	interdependent?
HDI25-30	Handford Road	SFB	Early	192	SFB 3002	3005, 3018, 3026, 3059, 3063-4	Ch	
HDI31	Handford Road	posthole	Early	32	SFB 3002	3102	Ch	interdependent?
HDI32	Handford Road	posthole	Early	16	SFB 3002	3211	Ch	interdependent?
HDI33	Handford Road	posthole	Early	16	SFB 3002	3212	Ch	interdependent?
HDI34	Handford Road	SFB	Early	32	285	286	Ch	
HDI35-36	Handford Road	SFB	Early	64	985	986 & 2001	Ch	
HDI37-38	Handford Road	SFB	Early	64	2554	2555-2556	Ch	
HDI39-42	Handford Road	pit	Early	112	3220	3221, 3225-6, 3244	Ch	
HDI43	Handford Road	pit	Early	32	3484	3485	Ch	
HDI44	Handford Road	hearth/oven	Early	32	3405	3760	Ch	
HDI45	Handford Road	pit	Early	32	3372	3948	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
HDI46	Handford Road	hearth/oven	Early	32	4030	3980	Ch	
HHS1	Eye	SFB	Early	10	14, 15	2	Ch	
HHS2	Eye	SFB	Early	10	14, 33	5	Ch	
HHS3	Eye	SFB	Early	10	14, 85	12	Ch	
HHS4	Eye	SFB	Early	10	14, 86	13	Ch	
HHS5	Eye	SFB	Early	10	14, 89	17	Ch	
HHS6	Eye	SFB	Early	10	14, 95	18	Ch	
HHS7	Eye	SFB	Early	10	14, 96	19	Ch	
HHS8	Eye	SFB	Early	10	14, 99	26	Ch	
HHS9	Eye	posthole	Early	10	, 125	38	Ch	
HHS10	Eye	SFB	Early	10	2052, 2015	14	Ch	
HHS11	Eye	SFB	Early	10	2052, 2017	15	Ch	
HHS12	Eye	SFB	Early	10	2052, 2018	16	Ch	
HHS13	Eye	SFB	Early	10	2052, 2025	20	Ch	
HHS14	Eye	SFB	Early	10	2052, 2019	23	Ch	
HHS15	Eye	posthole	Early	10	2032, 2044	29	Ch	
HHS16	Eye	posthole	Early	10	2033, 2045	30	Ch	
HHS17	Eye	posthole	Early	10	2039, 2051	31	Ch	
HHS18	Eye	posthole	Early	10	2035, 2047	34	Ch	
HHS19	Eye	posthole	Early	10	2037, 2049	35	Ch	
HHS20	Eye	posthole	Early	10	2038, 2050	36	Ch	
HHS21	Eye	SFB	Early	10	238, 202	43	Ch	
HHS22	Eye	SFB	Early	10	238, 203	44	Ch	
HHS23	Eye	SFB	Early	10	238,206	45	Ch	
HHS24	Eye	SFB	Early	10	238, 258	57	Ch	
HHS25	Eye	SFB	Early	10	238, 240	58	Ch	
HHS26	Eye	SFB	Early	10	262, 266	59	Ch	
HHS27	Eye	SFB	Early	10	262, 274	60	Ch	
HHS28	Eye	ditch	Early	10	495, 496	127	Ch	
HHS29	Eye	ditch	Early	10	495, 283	283	Ch	
HHS30	Eye	other	Early	10	F2503, 2506	351	Ch	
HHS31	Eye	other	Early	10	2554, 2555	352	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
HHS32	Eye	SFB	Early	10	568, 565	137	Ch	
HHS33	Eye	SFB	Early	10	568, 566	138	Ch	
HHS34	Eye	SFB	Early	10	568, 330	139	Ch	
HHS35	Eye	SFB	Early	10	568, 329	140	Ch	
HHS36	Eye	SFB	Early	10	568, 328	141	Ch	
HHS37	Eye	SFB	Early	10	568, 831	142	Ch	
HHS38	Eye	SFB	Early	10	568, 331	143	Ch	
HHS39	Eye	SFB	Early	10	568, 567	144	Ch	
HHS40	Eye	SFB	Early	10	783, 869	238	Ch	
HHS41	Eye	SFB	Early	10	783, 890	239	Ch	
HHS42	Eye	SFB	Early	10	783, 871	240	Ch	
HHS43	Eye	SFB	Early	10	783, 784	241	Ch	
HHS44	Eye	SFB	Early	10	783, 785	242	Ch	
HHS45	Eye	SFB	Early	10	913, 916	245	Ch	
HHS46	Eye	SFB	Early	10	913, 917	246	Ch	
HHS47	Eye	SFB	Early	10	913, 914	247	Ch	
HHS48	Eye	SFB	Early	10	913, 915	248	Ch	
HHS49	Eye	SFB	Early	10	713, 714	412	Ch	
HHS50	Eye	SFB	Early	10	713, 715	413	Ch	
HHS51	Eye	SFB	Early	10	713, 716	414	Ch	
HHS52	Eye	SFB	Early	10	713, 717	415	Ch	
HHS53	Eye	SFB	Early	10	845, 849	418	Ch	
HHS54	Eye	SFB	Early	10	845, 846	419	Ch	
HHS55	Eye	SFB	Early	10	3242, 3113	569	Ch	
HHS56	Eye	other	Early	10	2606, 2607	561	Ch	
HHS57	Eye	other	Early	10	2606, 2625	564	Ch	
HHS58	Eye	other	Early	10	2606, 3095	566	Ch	
HHS59	Eye	other	Early	10	2606, 2871	568	Ch	
HIL1	Fordham	pit	Mid	20	F218, 1177	20	Ch	
HIL2	Fordham	SFB	Mid	20	F257, 1258	21	Ch	
HSW1	Willingham	posthole	Mid	10	306	50	Ch	
HSW2	Willingham	posthole	Mid	8	395	52	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
HSW3	Willingham	posthole	Mid	4	356	43	Ch	
HSW4	Willingham	ditch	Mid	20	126	21	Ch	
HUT1	Hutchison Site	ditch	Mid	12	F.6, 401	4	Ch	
HUT2	Hutchison Site	ditch	Mid	8	F.420, 451	16	Ch	
HUT3	Hutchison Site	pit	Mid	8	F.552, 662	6	Ch	
HUT4	Hutchison Site	posthole	Mid	1	F.442, 3560	170	Ch	
HUT5	Hutchison Site	well	Mid	20	F.500, 1100/1	35	Ch	
HUT6	Hutchison Site	well	Mid	20	F.500, 1102/3	36	Ch	
HUT7	Hutchison Site	well	Mid	4	F.552, 1258	41	Ch	
HUT8	Hutchison Site	well	Mid	6	F.552, 1259	42/43	Ch	
HUT9	Hutchison Site	well	Mid	5	F.501, 1244	46	Ch	
HUT10	Hutchison Site	well	Mid	2	F.501, 1245	47	Ch	
HUT11	Hutchison Site	well	Mid	3	F.482, 3518	159	Ch	
HXQ1	Hinxton Quarry	SFB	Early	15	F.78 [511]	4	Ch	
IPS1	Ipswich	other	Mid	49	IAS 0802 0007		Ch	Tower Ramparts
IPS2	Ipswich	pit	Mid	126	IAS 0802 0052		Ch	Tower Ramparts
IPS3	Ipswich	other	Mid	98	IAS 0802 0109		Ch	Tower Ramparts
IPS4	Ipswich	other	Mid	24.5	IAS 0802 0182		Ch	Tower Ramparts
IPS5	Ipswich	pit	Mid	135	IAS 0802 0190		Ch	Tower Ramparts
IPS6	Ipswich	other	Mid	61	IAS 0802 0203		Ch	Tower Ramparts
IPS7	Ipswich	pit	Mid	-	IAS 4601 0192		Ch	Wingfield/Foundation St
IPS8	Ipswich	pit	Mid	-	IAS 4601 0648		Ch	Wingfield/Foundation St
IPS9	Ipswich	pit	Mid	-	IAS 4801 1668		Ch	School St/Foundation St
IPS10	Ipswich	pit	Mid	122	IAS 5202 0007		M	St Peter's/Greyfriars Road
IPS11	Ipswich	pit	Mid	-	IAS 5203 0046		Ch	Greyfriars Road
IPS12	Ipswich	pit	Mid	-	IAS 5203 0596		Ch	Greyfriars Road
IPS13	Ipswich	other	Mid	60	IAS 5502 0113		Ch	Lower Brook St
IPS14	Ipswich	other	Mid	65	IAS 5502 0229		Ch	Lower Brook St
IPS15	Ipswich	other	Mid	40	IAS 5502 0369		Ch	Lower Brook St
IPS16	Ipswich	other	Mid	55	IAS 5502 0374		Ch	Lower Brook St
IPS17	Ipswich	other	Mid	60	IAS 5502 0434		M/Ch	Lower Brook St
IPS18	Ipswich	other	Mid	75	IAS 5502 0537		Ch	Lower Brook St

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
IPS19	Ipswich	pit	Mid	-		IAS 5701 0017	Ch	Smart St/Foundation St
IPS20	Ipswich	other	Mid	116		IAS 5801 0019	Ch	Foundation St/Star Lane
IPS21	Ipswich	pit	Mid	80		IAS 5801 0028	Ch	Foundation St/Star Lane
IPS22	Ipswich	other	Mid	196		IAS 5801 0035	Ch	Foundation St/Star Lane
IPS23	Ipswich	pit	Mid	98		IAS 5801 0038	Ch	Foundation St/Star Lane
IPS24	Ipswich	other	Mid	147		IAS 5801 0059	M/Ch	Foundation St/Star Lane
IPS25	Ipswich	other	Mid	49		IAS 5901 0238	Ch	Key St
IPS26	Ipswich	other	Mid	135		IAS 5901 0288	Ch	Key St
IPS27	Ipswich	other	Mid	126		IAS 5901 0293	Ch	Key St
IPS28	Ipswich	other	Mid	73		IAS 5901 0320	Ch	Key St
IPS29	Ipswich	other	Mid	49		IAS 5902 0064	Ch	Fore St
IPS30	Ipswich	ditch	Intermediate	61		IAS 5902 0134	Ch	Fore St
IPS31	Ipswich	other	Mid	37		IAS 5902 0141	Ch	Fore St
IPS32	Ipswich	other	Mid	122		IAS 6904 0018	Ch	Shire Hall Yard
IPS33	Ipswich	other	Mid	98		IAS 6904 0026	Ch	Shire Hall Yard
IPS34	Ipswich	pit	Mid	147		IAS 6904 0051	Ch	Shire Hall Yard
IPS35	Ipswich	other	Mid	622		IAS 7402 0090	Ch	Vernon St
IPS36	Ipswich	other	Mid	435		IAS 7402 0237	Ch	Vernon St
IPS37	Ipswich	other	Mid	475		IAS 7402 0281	Ch	Vernon St
IPS38	Ipswich	other	Mid	122		IAS 7404 0005	Ch	Little Whip St
IPS39	Ipswich	other	Mid	147		IAS 7404 0020	Ch	Little Whip St
IPS40	Ipswich	pit	Mid	1		IAS 4302 0039	W	Turret Lane
IPS41	Ipswich	pit	Mid	6		IAS 5502 0455	W	Lower Brook St
KLV1	Kilverstone	SFB	Early	13	1220	25	Ch	
KLV2	Kilverstone	SFB	Early	11	1457	37	Ch	
KLV3	Kilverstone	SFB	Early	14	3277	79	Ch	
KLV4-5	Kilverstone	SFB	Early	30	3092 & 3094	70 & 71	Ch	
KLV6-7	Kilverstone	SFB	Early	20	3095 & 3096	67 & 72	Ch	
KLV8-9	Kilverstone	SFB	Early	26	705	35 & 36	Ch	
KLV10-11	Kilverstone	SFB	Early	28	3391 & 3394	80 and 83	Ch	
KLV12	Kilverstone	SFB	Early	13	3406	85	Ch	
KLV13-14	Kilverstone	SFB	Early	23	2078 & 2079	38 and 39	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
LAK1	RAF Lakenheath	ditch	Mid	20	92	-	Ch	
LAK2	RAF Lakenheath	pit	Mid	20	171	-	Ch	
LAK3	RAF Lakenheath	other	Mid	20	794	-	Ch	
LAK4	RAF Lakenheath	ditch	Mid	10	809	-	Ch	
LBQ1-3	Lackford Bridge Quarry	pit	Mid	11.55	026	sampled at 3 depths	Ch	
LBQ4	Lackford Bridge Quarry	SFB	Mid	3.85	101	-	Ch	
LBQ5	Lackford Bridge Quarry	pit	Mid	3.85	143	-	Ch	
LCM1	Lower Cambourne	pit	Generic	10	5247	560	Ch	
LCM2	Lower Cambourne	ditch	Generic	10	5722	578	Ch	
LE1	Lake End Road	pit	Early	40	3476	3016	Ch	
LE2	Lake End Road	pit	Mid	20	30589	3030	Ch	
LE3	Lake End Road	pit	Mid	20	30231	3008	Ch	
LE4	Lake End Road	pit	Mid	20	30230	3007	Ch	
LE5	Lake End Road	pit	Mid	20	30266	3005	Ch	
LE6	Lake End Road	pit	Mid	55	30659	3046	Ch	
LE7	Lake End Road	pit	Mid	60	30695	3047	Ch	
LE8	Lake End Road	pit	Mid	15	30623	3040	Ch	
LH1	Lot's Hole	pit	Mid	22	50310	77	Ch	
LH2	Lot's Hole	pit	Mid	33	50284	76	Ch	
LH3	Lot's Hole	pit	Mid	44	50287	12	Ch	
LH4	Lot's Hole	pit	Mid	34	50815	102	Ch	
LI1	Lower Icknield Way	pit	Intermediate	40	168	26	Ch	
LI2	Lower Icknield Way	pit	Intermediate	40	179	29	Ch	
LI3	Lower Icknield Way	other	Intermediate	40	430	107	Ch	
LI4	Lower Icknield Way	pit	Intermediate	40	896	71	Ch	
LI5	Lower Icknield Way	pit	Intermediate	40	906	78	Ch	
LLC1	Cottenham	other	Intermediate	10	F.101 [118]	1	Ch	
LLC2	Cottenham	ditch	Intermediate	12	F.235 [800]	69	Ch	
LLC3	Cottenham	other	Intermediate	10	F.284 [656]	57	Ch	
LLC4	Cottenham	ditch	Intermediate	9	F.303 [771]	66	Ch	
LLC5	Cottenham	ditch	Intermediate	5	F.335 [?]	105	Ch	
LLC6	Cottenham	other	Intermediate	-	F.337 [592]	53	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
LLC7	Cottenham	other	Intermediate	10	F.397 [661]	58	Ch	
LLC8	Cottenham	pit	Intermediate	6	F.569 [958]	84	Ch	
LLC9	Cottenham	ditch	Intermediate	8	F.602 [1189]	110	Ch	
LLC10	Cottenham	ditch	Intermediate	8	F.603 [1135]	98	Ch	
LLC11	Cottenham	other	Intermediate	15	F.631 [1187]	109	Ch	
LLC12	Cottenham	well	Intermediate	8	F.642 [1057]	90	Ch	
LLC13	Cottenham	ditch	Intermediate	8	F.647 [1066]	93	Ch	
LLC14	Cottenham	ditch	Intermediate	8	F.654 [1092]	97	Ch	
LLC15	Cottenham	pit	Intermediate	6	F.673 [1125]	96	Ch	
LLC16	Cottenham	pit	Intermediate	9	F.696 [1186]	108	Ch	
LLC17	Cottenham	posthole	Intermediate	10	F.717 [1242]	115	Ch	
LLC18	Cottenham	other	Intermediate	11	F.778 [1342]	127	Ch	
LLC19	Cottenham	posthole	Intermediate	8	F.784 [1348]	128	Ch	
LLC20	Cottenham	posthole	Intermediate	8	F.791 [1355]	126	Ch	
LLC21	Cottenham	other	Mid	10	F.117 [116]	4	Ch	
LLC22	Cottenham	other	Mid	10	F.127 [183]	6	Ch	
LLC23	Cottenham	other	Mid	10	F.130 [367]	34	Ch	
LLC24	Cottenham	other	Mid	10	F.166 [419]	32	Ch	interdependent?
LLC25	Cottenham	other	Mid	10	F.166 [?]	59	Ch	interdependent?
LLC26	Cottenham	other	Mid	10	F.193 [308]	24	Ch	
LLC27	Cottenham	other	Mid	10	F.259 [?]	35	Ch	
LM1	Littlemore	other	Early	10	107	115	Ch	
LM2	Littlemore	SFB	Early	12	125	131	Ch	
LM3	Littlemore	SFB	Early	10	155	157	Ch	interdependent?
LM4	Littlemore	SFB	Early	10	155	158	Ch	interdependent?
LM5	Littlemore	SFB	Early	7	138	123	Ch	
LM6	Littlemore	SFB	Early	10	182	170	Ch	interdependent?
LM7	Littlemore	SFB	Early	10	182	171	Ch	interdependent?
LM8	Littlemore	SFB	Early	10	187	185	Ch	
LQ1	Latton Quarry	pit	Early	20	431/562	41	Ch	
LQ2	Latton Quarry	posthole	Early	20	2327/2599	521	Ch	
LW1	Lake End Road	pit	Mid	30	41057	80	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
LW2-3	Lake End Road	pit	Mid	30	40478	28	Ch	
LW4	Lake End Road	pit	Mid	40	40624	117	Ch	
LW5	Lake End Road	pit	Mid	40	41125	87	Ch	
LW6	Lake End Road	pit	Mid	40	41425	97	Ch	
LW7	Lake End Road	pit	Mid	40	40787	53	Ch	
MCK1	Mucking	SFB	Generic	-	various	-	Cl	
MFB1	Berinsfield	well	Generic	-	82/21+19	-	W	
MFB2	Berinsfield	well	Generic	-	43/A/22	-	W	
MFB3	Berinsfield	pit	Generic	40	39 1	39 1	Ch	interdependent?
MFB4	Berinsfield	pit	Generic	40	39 2	39 2	Ch	interdependent?
MFB5	Berinsfield	pit	Generic	40	39 3	39 3	Ch	interdependent?
MFB6	Berinsfield	pit	Generic	40	39 4	39 4	Ch	interdependent?
MFB7	Berinsfield	pit	Generic	40	39 6	39 6	Ch	interdependent?
MFB8	Berinsfield	pit	Generic	40	41	41	Ch	
MFB9	Berinsfield	pit	Generic	40	42	42	Ch	
MFB10	Berinsfield	well	Generic	40	82 3	82 3	Ch	
MFB11	Berinsfield	well	Generic	40	82 6	82 6	Ch	
MFB12	Berinsfield	pit	Generic	21.2	283	283	Ch	
MFB13	Berinsfield	pit	Generic	40	324	324	Ch	
MFB14	Berinsfield	pit	Generic	40	664	664	Ch	
ML1	Market Lavington	ditch	Intermediate	18	1029		Ch	
ML2	Market Lavington	ditch	Intermediate	10	13711		Ch	
ML3	Market Lavington	ditch	Intermediate	20	13721		Ch	
ML4	Market Lavington	ditch	Intermediate	20	13726		Ch	
ML5	Market Lavington	pit	Intermediate	15	13730		Ch	
ML6	Market Lavington	pit	Intermediate	10	13744		Ch	
ML7	Market Lavington	SFB	Intermediate	20	13750		Ch	
ML8	Market Lavington	SFB	Intermediate	18	13752		Ch	
ML9	Market Lavington	SFB	Intermediate	20	13791		Ch	
ML10	Market Lavington	ditch	Intermediate	15	3024		Ch	
ML11	Market Lavington	ditch	Intermediate	18	3026		Ch	
ML12	Market Lavington	ditch	Intermediate	15	3045		Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
ML13	Market Lavington	ditch	Intermediate	20	15507		Ch	interdependent?
ML14	Market Lavington	ditch	Intermediate	16	15507		Ch	interdependent?
ML15	Market Lavington	ditch	Intermediate	15	15507		Ch	interdependent?
ML16	Market Lavington	ditch	Intermediate	18	15507		Ch	interdependent?
ML17	Market Lavington	ditch	Intermediate	10	15507		Ch	interdependent?
ML18	Market Lavington	other	Intermediate	20	14010		Ch	
ML19	Market Lavington	other	Intermediate	20	14110		Ch	
ML20	Market Lavington	other	Intermediate	20	14210		Ch	
ML21	Market Lavington	other	Intermediate	20	14310		Ch	
ML22	Market Lavington	other	Intermediate	20	14410		Ch	
ML23	Market Lavington	other	Intermediate	20	14510		Ch	
ML24	Market Lavington	other	Intermediate	20	14610		Ch	
ML25	Market Lavington	other	Intermediate	20	14710		Ch	
MMB1	Brettenham	hearth/oven	Early	12	2165	5	Ch	
MMB2	Brettenham	SFB	Early	12	2280	16	Ch	
MMB3	Brettenham	pit	Early	12	2430	17	Ch	
MMB4	Brettenham	SFB	Early	12	2536	21	Ch	
MMB5	Brettenham	pit	Early	12	2850	24	Ch	
MMB6	Brettenham	pit	Early	12	2847	26	Ch	
MPD1	Didcot	pit	Early	-	7/04	2	Ch	
MPD2	Didcot	pit	Early	-	17/4	3	Ch	
MPD3	Didcot	ditch	Early	-	24/11	4	Ch	
MPD4	Didcot	ditch	Early	-	25/04	5	Ch	
NEP1	North Elmham Park	well	Mid	-	AJ	-	W	
NEP2	North Elmham Park	well	Mid	-	AP	-	W	
NEP3	North Elmham Park	well	Mid	-	AQ	-	W	
NEP4	North Elmham Park	well	Mid	-	AV	-	W	
NEP5	North Elmham Park	well	Mid	-	AW	-	W	
NEP6	North Elmham Park	well	Mid	-	AX	-	W	
NEP7	North Elmham Park	well	Mid	-	AZ	-	W	
NEP8	North Elmham Park	well	Mid	-	BC	-	W	
NW1	Neptune Wood	pit	Intermediate	40	25426	25001	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
NW2	Neptune Wood	pit	Intermediate	40	25427	25003	Ch	
OUT1	Outwell	other	Early	10	O31	1	Ch	
PL1	Pennyland	pit	Intermediate	3.6	SFB1	62	Ch	
PL2	Pennyland	SFB	Intermediate	5.4	SFB1	242	Ch	
PL3	Pennyland	SFB	Mid	3.6	SFB2	48	Ch	
PL4	Pennyland	SFB	Mid	1.8	SFB2	255	Ch	
PL5	Pennyland	SFB	Mid	1.8	SFB2	256	Ch	
PL6	Pennyland	SFB	Mid	3.6	SFB2	257	Ch	
PL7	Pennyland	SFB	Mid	6	SFB2	259	Ch	
PL8	Pennyland	SFB	Mid	5.4	SFB3	699	Ch	
PL9	Pennyland	SFB	Mid	3.6	SFB4	743	Ch	
PL10	Pennyland	SFB	Intermediate	3.6	SFB5	689	Ch	
PL11	Pennyland	SFB	Intermediate	3.6	SFB6	695	Ch	
PL12	Pennyland	SFB	Early	1.8	SFB7	223	Ch	
PL13	Pennyland	SFB	Mid	1.8	SFB8	693	Ch	
PL14	Pennyland	SFB	Early	1.8	SFB9	658	Ch	
PL15	Pennyland	SFB	Intermediate	3.6	SFB11	744	Ch	
PL16	Pennyland	SFB	Early	3.6	SFB12	798	Ch	
PL17	Pennyland	SFB	Intermediate	3.6	SFB13	807	Ch	
PL18	Pennyland	other	Mid	1.8	-	737	Ch	
PL19	Pennyland	other	Mid	3.6	-	792	Ch	
PL20	Pennyland	other	Mid	1.8	-	793	Ch	
PL21	Pennyland	pit	Early	5.4	-	463	Ch	
PL22	Pennyland	pit	Intermediate	1.8	-	558	Ch	
PL23	Pennyland	pit	Intermediate	1	-	801	Ch	
PL24	Pennyland	ditch	Intermediate	1.8	-	630	Ch	
PL25	Pennyland	ditch	Intermediate	1.8	-	959	Ch	
PT1	Pitstone	pit	Early	20	G43	2	Ch	
PT2	Pitstone	SFB	Early	10	G28	3	Ch	
PT3	Pitstone	SFB	Early	10	G33	14	Ch	
PT4	Pitstone	pit	Early	-	G42	2	M	
PT5	Pitstone	SFB	Early	-	G25	-	CI	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
RFT1	Redcastle Furze	pit	Intermediate	15	549	18	M/Ch	
RFT2-3	Redcastle Furze	SFB	Intermediate	45	844	1-2	Ch	
RFT4-5	Redcastle Furze	SFB	Intermediate	45	795	3-4	Ch	
RFT6-7	Redcastle Furze	SFB	Intermediate	52	898	5-6	Ch	
RFT8-9	Redcastle Furze	SFB	Intermediate	43.5	810	7-8	Ch	
RFT10	Redcastle Furze	pit	Intermediate	12	1282	9	Ch	
RFT11	Redcastle Furze	SFB	Intermediate	18	1298	10	Ch	
RFT12	Redcastle Furze	SFB	Intermediate	72	1667	14	Ch	
RFT13	Redcastle Furze	SFB	Intermediate	102	1598	11	Ch	
RFT14	Redcastle Furze	pit	Intermediate	13.5	1817	21	Ch	
RFT15	Redcastle Furze	SFB	Intermediate	18	1936	23	Ch	
RFT16	Redcastle Furze	SFB	Intermediate	25	1964	24	Ch	
RFT17	Redcastle Furze	SFB	Intermediate	18	2124	27	Ch	
ROS1	Rosemary Lane	ditch	Mid	6	1281	100	Ch	
ROS2	Rosemary Lane	ditch	Mid	16	1289	101	Ch	
ROS3	Rosemary Lane	ditch	Mid	14	1291	102	Ch	
ROS4	Rosemary Lane	ditch	Mid	15	1411	110	Ch	
RY1	Rycote	ditch	Generic	20	1111	8	Ch	
SB1	Hintlesham	ditch	Mid	-	60	3	Ch	
SC1	Sutton Courtenay	pit	Intermediate	20	367	8	Ch	
SC2	Sutton Courtenay	pit	Intermediate	16	318	6	Ch	
SC3	Sutton Courtenay	pit	Intermediate	40	454	25	Ch	
SC4	Sutton Courtenay	pit	Intermediate	40	404	22	Ch	
SH1	Lechlade	SFB	Intermediate	30	152		Ch	
SH2	Lechlade	SFB	Intermediate	30	154		Ch	
SH3	Lechlade	SFB	Intermediate	30	242		Ch	
SH4	Lechlade	SFB	Intermediate	30	243		Ch	
SHB1	Benson	SFB	Intermediate	20	364	81	Ch	
SHB2	Benson	pit	Intermediate	10	399	87	Ch	
SHF1	Slough House Farm	well	Intermediate	-	2957	30-40cm	W	column
SHF2	Slough House Farm	well	Intermediate	-	2957	40-50cm	W	column
SHF3	Slough House Farm	well	Intermediate	-	2957	50-60cm	W	column

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
SHF4	Slough House Farm	well	Intermediate	-	2957	60-70cm	W	column
SHF5	Slough House Farm	well	Intermediate	-	130, 362	-	W	
SHF6	Slough House Farm	well	Intermediate	-	130, 313	-	W	
SHF7	Slough House Farm	well	Intermediate	-	130, 176	-	W	
SHF8	Slough House Farm	well	Intermediate	-	130, 175	-	W	
SHF9	Slough House Farm	well	Intermediate	-	195, 196	111	Ch	
SHF10	Slough House Farm	well	Intermediate	-	196, 235	114	Ch	
SHF11	Slough House Farm	well	Intermediate	-	294, 295	115	Ch	
SHF12	Slough House Farm	well	Intermediate	-	318, 318	117	Ch	
SMB1	Brandon (BRD 071)	pit	Early	11	239	-	Ch	
SMB2	Brandon	pit	Mid	-	0045	-	Ch/W	
SMB3	Brandon	other	Mid	-	0055	-	Ch	
SMB4	Brandon	other	Mid	-	0062	-	Ch	
SMB5	Brandon	other	Mid	-	0074	-	Ch	
SMB6	Brandon	other	Mid	-	0110	-	Ch	
SMB7	Brandon	other	Mid	-	0147	-	Ch	
SMB8	Brandon	other	Mid	-	0201	-	Ch	
SMB9	Brandon	other	Mid	-	0215	-	Ch	
SMB10	Brandon	other	Mid	-	0298	-	Ch	
SMB11	Brandon	ditch	Mid	1.5	0539	-	Ch	
SMB12	Brandon	other	Mid	1.8	1035	-	Ch	
SMB13	Brandon	other	Mid	-	5038	-	Ch	
SMB14	Brandon	other	Mid	-	5742	-	Ch	
SMB15	Brandon	other	Mid	-	5755	-	Ch	
SMB16	Brandon	other	Mid	-	5764	-	Ch	
SMB17	Brandon	other	Mid	-	6232	-	Ch	
SMB18	Brandon	other	Mid	-	6457	-	Ch	
SMB19	Brandon	other	Mid	-	6113	-	W	
SMB20	Brandon	other	Mid	-	6358	-	W	
SMB21	Brandon	other	Mid	-	6385	-	W	
SMB22	Brandon	other	Mid	-	6387	-	W	
SMB23	Brandon	other	Mid	-	91/59, 4293	-	Ch	grid squares

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
SMB24	Brandon	other	Mid	-	91/59, 4297	-	Ch	grid squares
SMB25	Brandon	other	Mid	-	91/59, 4301	-	Ch	grid squares
SMB26	Brandon	other	Mid	-	91/60, 4333	-	Ch	grid squares
SMB27	Brandon	other	Mid	-	91/60, 4345	-	Ch	grid squares
SMB28	Brandon	other	Mid	-	91/61, 4681	-	Ch	grid squares
SMB29	Brandon	other	Mid	-	91/61, 4683	-	Ch	grid squares
SMB30	Brandon	other	Mid	-	91/61, 4684	-	Ch	grid squares
SMB31	Brandon	other	Mid	-	90/61, 4966	-	Ch	grid squares
SMB32	Brandon	other	Mid	-	90/61, 4967	-	Ch	grid squares
SMB33	Brandon	other	Mid	-	90/61, 4969	-	Ch	grid squares
SMB34	Brandon	other	Mid	-	90/61, 4970	-	Ch	grid squares
SMB35	Brandon	other	Mid	-	89/61, 5059	-	Ch	grid squares
SMB36	Brandon	other	Mid	-	89/61, 5062	-	Ch	grid squares
SMB37	Brandon	other	Mid	-	89/61, 5063	-	Ch	grid squares
SMB38	Brandon	other	Mid	-	89/61, 5064	-	Ch	grid squares
SMB39	Brandon	other	Mid	-	89/61, 5065	-	Ch	grid squares
SMB40	Brandon	other	Mid	-	88/61, 5224	-	Ch	
SMB41	Brandon	other	Mid	-	88/61, 5233	-	Ch	
SMB42	Brandon	other	Mid	-	88/61, 5234	-	Ch	
SMB43	Brandon	other	Mid	-	89/62, 5356	-	Ch	
SMB44	Brandon	other	Mid	-	89/62, 5358	-	Ch	
SMB45	Brandon	other	Mid	-	89/62, 5362	-	Ch	
SMB46	Brandon	other	Mid	-	89/62, 5364	-	Ch	
SMB47	Brandon	other	Mid	-	89/62, 5365	-	Ch	
SMB48	Brandon	other	Mid	-	90/62, 5447	-	Ch	
SMB49	Brandon	other	Mid	-	90/62, 5375	-	Ch	
SMB50	Brandon	other	Mid	-	90/62, 5382	-	Ch	
SMB51	Brandon	other	Mid	-	91/62, 5044	-	Ch	
SMB52	Brandon	other	Mid	-	91/62, 5045	-	Ch	
SMB53	Brandon	other	Mid	-	91/62, 5046	-	Ch	
SMB54	Brandon	other	Mid	-	91/62, 5050	-	Ch	
SMB55	Brandon	other	Mid	-	90/63, 5784	-	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
SMB56	Brandon	other	Mid	-	90/63, 5787	-	Ch	
SPH1	Spong Hill	SFB	Early	36	128 [128-3]	-	Ch	
SPH2	Spong Hill	SFB	Early	24	3161 [3396]	-	Ch	
SPH3	Spong Hill	SFB	Early	12	3333 [3482]	-	Ch	
SPH4	Spong Hill	SFB	Early	12	3423 [3485]	-	Ch	
SPH5	Spong Hill	pit	Early	12	1621	-	Ch	
SR1	Spring Road	SFB	Early	40	2479	19	Ch	
SR2	Spring Road	SFB	Early	40	2672	22	Ch	
SR3	Spring Road	SFB	Early	40	2673	23	Ch	
SR4	Spring Road	SFB	Early	40	2686	34	Ch	
SSA1	Stansted Airport	other	Early	11	2330	5	Ch	
SSA2	Stansted Airport	pit	Early	6	2104	38	Ch	
STG1	Stonea Grange	other	Sub-Roman	295		various (x35)	Ch	assemblage only
TMB1	Two Mile Bottom	other	Early	-		9 pits	Ch	assemblage only
TMS1	St Aldate's 89-91	ditch	Mid	-	665	85/1	W	
TP1	Taplow Court	ditch	Mid	40	460	579	Ch	
TP2	Taplow Court	ditch	Mid	40	3004	303	Ch	
TSC1	Terrington St Clement	pit	Mid	7	86	1	Ch	
TSC2	Terrington St Clement	pit	Mid	7	8	2	Ch	
TSC3	Terrington St Clement	ditch	Mid	7	75	4	Ch	
TSC4	Terrington St Clement	ditch	Mid	7	26	5	Ch	
TSC5	Terrington St Clement	ditch	Mid	7	117	6	Ch	
TSC6	Terrington St Clement	ditch	Mid	7	76	2	Ch	
TSC7	Terrington St Clement	ditch	Mid	7	106	3	Ch	
W1	Worton	posthole	Mid	30		3, 25, 27	Ch	assemblage only
W2	Worton	other	Mid	50		1, 2, 23, 24, 28	Ch	assemblage only
WAL1	Walton Lodge	pit	Intermediate	-	354	2008	Ch	
WE1	Bletchley	ditch	Mid	30	143	11	Ch	
WE2	Bletchley	ditch	Mid	29	64	7	Ch	
WE3	Bletchley	pit	Mid	28	90	8	Ch	
WE4	Bletchley	ditch	Mid	29.5	58	9	Ch	
WE5	Bletchley	pit	Mid	3	91	1	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
WE6	Bletchley	SFB	Mid	25	193	4	Ch	
WE7	Bletchley	ditch	Mid	29	48	6	Ch	
WF1	Wickhams Field	pit	Mid	-	536, 542		Ch	assemblage only
WF2	Wickhams Field	well	Mid	1	301	1016	W	
WF3	Wickhams Field	well	Mid	5	322	1086	W	
WFC1	Consortium Site	pit	Mid	20	742 (P741)	8	Ch	
WFC2	Consortium Site	pit	Mid	10	772 (P17)	9	M	
WFC3	Consortium Site	ditch	Mid	20	834 (D766)	11	Ch	
WFC4	Consortium Site	pit	Mid	20	902 (P167)	16	Ch	
WFC5	Consortium Site	well	Mid	20	922 (W173)	17	Ch	
WFC6	Consortium Site	well	Mid	20	919 (W173)	18	Ch	
WFC7	Consortium Site	well	Mid	20	950 (W173)	19	Ch	
WFC8	Consortium Site	well	Mid	20	970 (W173)	22	Ch	
WFC9	Consortium Site	well	Mid	20	969 (W173)	23	Ch	
WFC10	Consortium Site	well	Mid	20	971 (W173)	24	Ch	
WFC11	Consortium Site	ditch	Mid	20	1183 (D1861)	27	Ch	
WFC12	Consortium Site	pit	Mid	20	1294 (P52)	29	Ch	
WFC13	Consortium Site	pit	Mid	20	296 (P210)	43	Ch	
WFC14	Consortium Site	pit	Mid	20	1734 (P1733)	45	Ch	
WFC15	Consortium Site	ditch	Mid	40	1756 (G1755)	47	Ch	
WFC16	Consortium Site	pit	Mid	20	1900 (P1897)	55	Ch	
WFR1	Ashwell Site	pit	Mid	8	1834	16	Ch	
WFR2	Ashwell Site	ditch	Mid	8	2223	32	Ch	
WFR3	Ashwell Site	pit	Mid	12	2519	66	Ch	
WFR4	Ashwell Site	posthole	Mid	4	2642	71	Ch	
WFR5	Ashwell Site	pit	Mid	8	7162	165	Ch	
WFR6	Ashwell Site	pit	Mid	5	7163	162	Ch	
WG1	Wavendon Gate	ditch	Early	15	1102	85	Ch	
WG2	Wavendon Gate	ditch	Early	15	1135	88	Ch	
WG3	Wavendon Gate	pit	Early	15	1158	100	Ch	
WG4	Wavendon Gate	pit	Early	15	1157	101	Ch	
WHR1	Whitehouse Road	other	Mid	7	526	-	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
WHR2	Whitehouse Road	other	Mid	7.5	559	-	Ch	
WHR3	Whitehouse Road	other	Mid	7	1692	-	Ch	
WHR4	Whitehouse Road	other	Mid	7	1724	-	M/Ch	
WHR5	Whitehouse Road	other	Mid	7	1725	-	Ch	
WHR6	Whitehouse Road	other	Mid	7	1735	-	Ch	
WHR7	Whitehouse Road	other	Mid	7	1741	-	Ch	
WHR8	Whitehouse Road	other	Mid	7	1742	-	M	
WIL1	Wilton	hearth/oven	Intermediate	5	596	146	Ch	
WIL2	Wilton	hearth/oven	Intermediate	8	595	147	Ch	
WIL3	Wilton	hearth/oven	Intermediate	0.5	594	148	Ch	
WIL4	Wilton	hearth/oven	Intermediate	0.5	597	149	Ch	
WIL5	Wilton	hearth/oven	Intermediate	3	609	155	Ch	
WIL6	Wilton	hearth/oven	Intermediate	10	610	156	Ch	
WIL7	Wilton	hearth/oven	Intermediate	0.5	612	158	Ch	
WIL8	Wilton	hearth/oven	Intermediate	2	614	160	Ch	
WIL9	Wilton	hearth/oven	Intermediate	3	615	161	Ch	
WIL10	Wilton	SFB	Intermediate	20	550	124	Ch	interdependent?
WIL11	Wilton	SFB	Intermediate	18	550	139	Ch	interdependent?
WIL12	Wilton	SFB	Intermediate	10	550	181	Ch	interdependent?
WIL13	Wilton	posthole	Intermediate	3	653	182	Ch	
WIL14	Wilton	posthole	Intermediate	6	655	183	Ch	
WIL15	Wilton	pit	Intermediate	4	586	140	Ch	
WIL16	Wilton	pit	Intermediate	20	622	168	Ch	
WIL17	Wilton	posthole	Intermediate	10	690	197	Ch	interdependent?
WIL18	Wilton	posthole	Intermediate	10	690	198	Ch	interdependent?
WIL19	Wilton	pit	Intermediate	10	392	88	Ch	
WIL20	Wilton	pit	Intermediate	1	342	81	Ch	
WKB1	Wicken Bonhunt	ditch	Intermediate	180	F605	B	Ch	
WKB2	Wicken Bonhunt	ditch	Mid	180	F914	C	Ch	
WKB3	Wicken Bonhunt	well	Mid	72	F569	E	W	
WLP1	Walpole St Andrew	pit	Mid	7	29	1	Ch	
WLP2	Walpole St Andrew	ditch	Mid	7	129	2	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
WLP3	Walpole St Andrew	other	Mid	7	188	3	Ch	
WLP4	Walpole St Andrew	pit	Mid	7	216	5	Ch	
WLP5	Walpole St Andrew	pit	Mid	7	300	7	Ch	
WLP6	Walpole St Andrew	pit	Mid	8	239	8	Ch	
WLP7	Walpole St Andrew	ditch	Mid	10.5	199	9	Ch	
WLP8	Walpole St Andrew	ditch	Mid	9	231	10	Ch	
WLP9	Walpole St Andrew	ditch	Mid	9	40	11	Ch	
WLP10	Walpole St Andrew	ditch	Mid	7	17	12	Ch	
WLP11	Walpole St Andrew	pit	Mid	7	106	13	Ch	
WO1	Walton Orchard	other	Intermediate	10	270	-	Ch	
WO2	Walton Orchard	other	Intermediate	40	650	-	Ch	
WO3	Walton Orchard	other	Intermediate	10	652	-	Ch	
WO4	Walton Orchard	other	Intermediate	30	777	-	Ch	
WO5	Walton Orchard	other	Intermediate	20	866	-	Ch	
WO6	Walton Orchard	other	Intermediate	10	987	-	Ch	
WO7	Walton Orchard	other	Intermediate	10	1374	-	Ch	
WO8	Walton Orchard	other	Intermediate	10	1693	-	Ch	
WO9	Walton Orchard	other	Intermediate	5	1878	-	Ch	
WO10	Walton Orchard	other	Intermediate	10	2076	-	Ch	
WRS1	Walton Road Stores	SFB	Generic	-	2171	3002	Ch	
WRS2	Walton Road Stores	SFB	Generic	-	2178	3003	Ch	
WRS3	Walton Road Stores	SFB	Generic	-	2389	3014	Ch	
WRS4	Walton Road Stores	SFB	Generic	-	2475	3020	Ch	
WRS5	Walton Road Stores	SFB	Generic	-	2480	3019	Ch	
WRS6	Walton Road Stores	SFB	Generic	-	367	3502	Ch	
WRS7	Walton Road Stores	pit	Generic	-	271	3505	Ch	
WRS8	Walton Road Stores	SFB	Generic	-	577	3519	Ch	
WRS9	Walton Road Stores	SFB	Generic	-	482	3521	Ch	
WS1	Westbury-by-Shenley	well	Mid	-	30986	20344	W	
WS2	Westbury-by-Shenley	well	Mid	-	30605	20308	W	
WS3	Westbury-by-Shenley	well	Mid	-	31421-3	20373	W	
WS4	Westbury-by-Shenley	well	Mid	-	31291	20362	W	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
WSA1	Walton Street	posthole	Intermediate	30	3010	1	Ch	
WSA2	Walton Street	ditch	Intermediate	40	3014	3	Ch	
WSA3	Walton Street	ditch	Intermediate	40	3016	4	Ch	
WST1	West Stow	SFB	Early	4108.7	63	1	Ch	
WST2	West Stow	pit	Generic	-	59	3	Ch	
WST3	West Stow	other	Generic	-		SFBs and Layer	CI	
WT1	Wolverton Turn	ditch	Mid	-	1	-	Ch	
WT2	Wolverton Turn	ditch	Mid	-	1	-	Ch	
WT3	Wolverton Turn	ditch	Mid	-	1	-	Ch	
WT4	Wolverton Turn	ditch	Mid	-	1	-	Ch	
WT5	Wolverton Turn	ditch	Mid	-	1	-	Ch	
WT6	Wolverton Turn	ditch	Mid	-	5	-	Ch	
WT7	Wolverton Turn	ditch	Mid	-	5	-	Ch	
WT8	Wolverton Turn	other	Mid	-	23	-	Ch	
WT9	Wolverton Turn	ditch	Mid	-	8	-	Ch	
WT10	Wolverton Turn	ditch	Mid	-	8	-	Ch	
WT11	Wolverton Turn	ditch	Mid	-	9	-	Ch	
WT12	Wolverton Turn	ditch	Mid	-	6	-	Ch	
WT13	Wolverton Turn	ditch	Mid	-	7	-	Ch	
WT14	Wolverton Turn	ditch	Mid	-	7	-	Ch	
WT15	Wolverton Turn	ditch	Mid	-	1(429)	-	Ch	
WT16	Wolverton Turn	ditch	Mid	-	1(430)	-	Ch	
WT17	Wolverton Turn	ditch	Mid	-	1(430)	-	Ch	
WT18	Wolverton Turn	hearth/oven	Mid	-	418, 489	-	Ch	
WTN1	Witton	SFB	Early	420	Structure D	-	Ch	
WTN2	Witton	SFB	Early	1113	Structure C	-	Ch	
WV1	Walton Vicarage	pit	Generic	-	P5	632 (upper)	Ch	interdependent?
WV2	Walton Vicarage	pit	Generic	-	P5	632 (lower)	Ch	interdependent?
WV3	Walton Vicarage	pit	Generic	-	P5	634	Ch	interdependent?
WV4	Walton Vicarage	other	Generic	-	-	-	CI	
WWI1	Ingleborough	ditch	Mid	7	85	6	Ch	
WWI2	Ingleborough	ditch	Mid	7	86	7	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
WWI3	Ingleborough	ditch	Mid	7	88	8	Ch	
WWI4	Ingleborough	other	Mid	7.5	80	9	Ch	
WWI5	Ingleborough	ditch	Mid	7	95	11	Ch	
WWI6	Ingleborough	pit	Mid	7	109	14	Ch	
WWI7	Ingleborough	ditch	Mid	10.5	115	17	Ch	
WWI8	Ingleborough	other	Mid	7	102	18	Ch	
WWI9	Ingleborough	other	Mid	7	186	19	Ch	
WYM1	Wymondham	hearth/oven	Generic	10	F63, 64	1	Ch	
Y1	Yarnton	other	Early	20	354	70, 72	Ch	
Y2	Yarnton	other	Early	10	888	51	Ch	
Y3	Yarnton	pit	Early	10	2050	52	Ch	
Y4	Yarnton	SFB	Early	20	2652	82, 86	Ch	
Y5	Yarnton	SFB	Early	10	2689	77	Ch	
Y6	Yarnton	SFB	Intermediate	10	2551	63	Ch	
Y7	Yarnton	SFB	Intermediate	10	2552	66	Ch	
Y8	Yarnton	SFB	Intermediate	10	2556	64	Ch	
Y9	Yarnton	SFB	Intermediate	10	2561	65	Ch	
Y10	Yarnton	SFB	Intermediate	10	2563	62	Ch	
Y11	Yarnton	SFB	Intermediate	10	2577	67	Ch	
Y12	Yarnton	SFB	Intermediate	10	3004	275	Ch	
Y13	Yarnton	SFB	Intermediate	20	3036	280, 281	Ch	
Y14	Yarnton	ditch	Intermediate	10	3045	264	Ch	
Y15	Yarnton	posthole	Intermediate	5	3192	798	Ch	
Y16	Yarnton	posthole	Intermediate	5	3209	796	Ch	
Y17	Yarnton	posthole	Intermediate	5	3221	794	Ch	
Y18	Yarnton	posthole	Intermediate	5	3256	799	Ch	
Y19	Yarnton	ditch	Intermediate	20	3279	271, 267	Ch	
Y20	Yarnton	ditch	Intermediate	40	3287	269, 270, 278, 279	Ch	
Y21	Yarnton	hearth/oven	Intermediate	10	3305	241	Ch	
Y22	Yarnton	ditch	Intermediate	20	3572	286, 287	Ch	
Y23	Yarnton	posthole	Intermediate	10	3891	256, 257	Ch	
Y24	Yarnton	pit	Intermediate	20	3928	290, 291	Ch	

sample	site	feature	chronology	volume	context(s)	sample(s)	preservation	notes
Y25	Yarnton	posthole	Mid	5	2616	61	Ch	
Y26	Yarnton	ditch	Mid	20	3031	220, 221	Ch	
Y27	Yarnton	ditch	Mid	10	3035	218	Ch	
Y28	Yarnton	ditch	Mid	20	3039	224, 225	Ch	
Y29	Yarnton	pit	Mid	20	3040	226, 227	Ch	
Y30	Yarnton	pit	Mid	40	3043	234, 235, 236, 237	Ch	
Y31	Yarnton	ditch	Mid	20	3057	222, 223	Ch	
Y33	Yarnton	ditch	Mid	20	3176	770, 769	Ch	
Y34-5	Yarnton	other	Mid	20	3314	791 & 812	Ch	
Y36	Yarnton	posthole	Mid	5	3317	707	Ch	
Y37	Yarnton	posthole	Mid	5	3392	703	Ch	
Y38	Yarnton	ditch	Mid	10	3429	815	Ch	
Y39	Yarnton	ditch	Mid	10	3431	811	Ch	
Y40	Yarnton	posthole	Mid	5	3436	702	Ch	
Y41	Yarnton	ditch	Mid	20	3512	292, 293	Ch	
Y42	Yarnton	posthole	Mid	5	3527	706	Ch	
Y43	Yarnton	posthole	Mid	5	3538	705	Ch	
Y44	Yarnton	ditch	Mid	20	3629	789, 790	Ch	
Y45	Yarnton	ditch	Mid	20	3641	787, 788	Ch	
Y46	Yarnton	ditch	Mid	20	3646	808, 809	Ch	
Y47	Yarnton	pit	Mid	20	3693	246, 248	Ch	
Y48	Yarnton	posthole	Mid	5	3738	701	Ch	
Y49	Yarnton	other	Mid	10	5042	754	Ch	
Y50	Yarnton	well	Mid	-	3029/B/9	212	W	
Y51	Yarnton	well	Mid	-	3043/A/9	238	W	

Appendix 3: Analysis of Charred Plant Remains from Lyminge

Introduction

The village of Lyminge (TR 1610 4085) lies near the south-east coast of Kent (Figure 1). The solid geology of the area is Lower Chalk, which is overlain in places by silts, clays, sands and gravels. The chalk of the North Downs extends to the north and west, forming the northern boundary of the (once heavily-wooded) ridges of the High Weald, a region characterised by sandstones and clays.[635]



Figure 1 - Location of Lyminge within southern England (Digital Mapping Data © Collins Bartholomew 1995).

The modern village occupies the site of a documented Mid Saxon double minster and an earlier, pre-Christian royal complex. At the time of writing, the site has been subject to research excavation since 2008, under the direction of Dr Gabor Thomas of the University of Reading.[636] During the course of data-collection for this thesis, the opportunity arose to undertake first-hand analysis of selected archaeobotanical samples from the 2008 excavations, which uncovered a

[635] See *e.g.* Trueman *et al.* 1971 pp.89–105.
[636] Thomas 2013; I am grateful to Dr Thomas for the opportunity to include this material in my research.

domestic area near the ecclesiastical core of the precinct, including a zone – in Trench 1 – provisionally interpreted as an agricultural storage/processing area, with a large, aisled, post-built structure that may represent a barn and a metalled surface that could represent an external threshing floor.[637]

The object of this appendix is to present the principal archaeobotanical data obtained from this work, as utilized in the analytical sections at the core of this thesis, including the presence and abundance of botanical taxa, and key derived attributes for each of the analysed samples: total abundance, average density, dominant crop types, crop processing classifications, and the relative proportions of different free-threshing cereals.

Selection of samples

Nearly every context in the excavation was sampled for the recovery of environmental remains. The plant remains recovered from the samples were subject to an assessment conducted by Gill Campbell of English Heritage.[638] Both charred and mineralized remains were identified, the former being predominant.

The ten samples most abundant in charred plant macrofossils, as suggested by the results of Campbell's assessment, were selected by the author for further analysis (Table 1). Some sorting and analysis of this material had already been undertaken by Wendy Charlton at the University of Nottingham, but the author was unable to obtain further information regarding this work. All but one of the selected samples derive from Trench 1; this distribution was unknown to the author at the time of selection, and may in itself be considered to reinforce the agricultural interpretation of the zone, as mentioned above.

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[637] Thomas 2009, pp.6-7.
[638] Campbell 2012.

Table 1 – Samples selected for analysis (after Campbell 2012).

sample	no. bags	trench	context	context type	volume (litres)
<02>	8	1	(52) [51]	'potential SFB'	40
<03>	1	1	(82)	post ghost	5
<05>	8	1	(164) [71]	pit	40
<08>	2	1	(82) [81]	pit/feature	10
<24>	6	1	(270) [49]	pit	30
<26>	1	1	(163)	metalled surface	5
<30>	4	1	(233) [47]	pit	20
<42>	1	1	(291) [290]	post hole	5
<53>	8	1	(296) [255]	pit	40
<518>	1	2	(700) [617]	pit	5

Methodology

The samples were received in a cleaned state: floated, bagged, and in some cases partially sorted. Each sample represents a single excavated context, although some of the samples consist of separately bagged sub-samples, labelled sequentially ('1/4', '2/4', *et cetera*). These units are here termed 'bags', to avoid confusion with the laboratory-derived 'random subsamples' described below.

The flot derived from each of these bags represents approximately five litres of sediment. Samples <02> and <05> each consist of eight bags, but these appear to have been amalgamated and could not be separately analysed. Hence they are treated here as two single samples, each of 40 litres. Sample <24> consists of six bags, but no bag labelled '6/6' could be found. Four bags of partially sorted material from <24> were present but lacked any numbered labels. For this analysis, they have been labelled 'A', 'B', 'C' and 'D' respectively. It is presumed that together they represent the missing bag '6/6'.

Some bags appeared to have been mislabelled, and for the purposes of this report have been relabelled as follows. In <30> there are two bags labelled '4/4' and none labelled '3/4'. The first of these ('4/4 (1)') is here treated as '3/4'. In <58> there are two bags labelled '6/8' and none labelled '5/8' – the first of these ('6/8 (1)') is here treated as '5/8'.

Some of the material had already been fully or partially sorted into object categories, *e.g.* 'seeds', 'shells', 'bone', when received. A small number of species identifications had also been made. Much of this sorting and some of the identifications were found to be incomplete or inaccurate. The material was therefore re-sorted. Sorting was facilitated by separating the flots into three size fractions using laboratory sieves of 2mm and 1mm aperture. In addition, most samples already included a bag containing a fine fraction (labelled 'fine'), obtained using an unspecified mesh size. Samples and bags which were deemed too large to study in their entirety were halved or quartered using a riffle-box. The fractions of flot (*i.e.* the laboratory-derived random subsamples) analysed for each bag and sample are detailed in the data tables at the end of this report (Table 9).

The flots were selectively sorted for charred plant macrofossils at the Donald Baden-Powell Quaternary Research Centre (Institute of Archaeology, University of Oxford) using a binocular microscope at magnifications between x6 and x50. Macrofossils were extracted and identified where possible using modern reference material and published keys,[639] with guidance and supervision from Amy Bogaard. Additional work was undertaken at Fort Cumberland using the English Heritage reference collection, with assistance from Gill Campbell and Ruth Pelling. Nomenclature for most species follows Stace 2010; for some cereal taxa, traditional nomenclature has been employed with reference to Cappers & Neef 2012.

The results of the analyses are tabulated at the end of this report (Table 9). Unless otherwise stated, all counts refer to grains, seeds, or equivalent propagules. Quantities were derived for 'minimum numbers of individuals' (MNI) in each taxonomic category. Thus for grains, the total counts include both whole (or nearly whole) caryopses, and embryo or apical ends – whichever was greater in a given flot. For pulses, the counts include both whole seeds and paired

[639] Berggren 1969; Berggren 1981; Anderberg 1994; Körber-Grohne 1991; Jacomet 2006; Cappers *et al.* 2012.

cotyledons. For charcoal, the total volume of large pieces (those greater than 2mm in diameter) was estimated in millilitres. For all other items, *e.g.* shell or insect parts, presence was recorded in a non-quantitative manner.

The quantities given in the data tables (Table 9) relate exactly to the random subsamples analysed for each sample or bag, and should be scaled up by the corresponding factor to obtain equivalent quantities for entire samples/bags. Hence, for example, quantities presented for sample <02> should be doubled, because only 50% of the flot was analysed.

Preservation was assessed following the recommendations of Hubbard and al Azm, but applying their system to whole samples/bags rather than to individual grains. According to their system, '1' denotes perfect preservation, while '6' denotes 'clinkered' grains whose shape is preserved only as a mass of bubbled starch; classes 2-5 denote intermediate states of preservation.[640]

In accordance with the methodologies applied in the core archaeobotanical analyses of this thesis, two additional variables were derived for each sample: abundance and average density.[641] Separate bags have been treated collectively for the calculation of these derived attributes.

[640] Hubbard & al Azm 1990 p.104, Table 1.
[641] See main text, §§3.8–3.9.

Results: taxonomic inventory

The quantitative results of this analysis are presented in the data tables at the end of this report (Table 9); this section provides a brief commentary on the various taxa identified in the samples.

Cereals

Cereals dominate almost all samples and individual bags; barley, wheat, rye and oat are all represented, alongside many indeterminate cereal remains. Barley (*Hordeum* L.) is represented mostly by grains – biconvex in shape, with a shallow ventral groove – including several hulled and twisted grains that may indicate that six-row hulled *Hordeum vulgare* L. was the preferred species. Some chaff is present (including rachis nodes, lemma bases, and grains still in their florets); in most instances, no additional taxonomic information could be obtained from the chaff, although a lemma base in sample <30> has the horseshoe-shaped depressions characteristic of two-row *Hordeum distichon* or lax-eared *Hordeum vulgare*.[642]

Rye (*Secale cereale* L.) is represented only by grains, identified as such by their deep ventral grooves, high dorsal ridges, and tapering embryo ends. No rye chaff has been positively identified in the selected samples.

Grains of oat (*Avena* L.) occur in several samples, identified as such by a very shallow ventral groove, a triangular impression around the embryo end, and a long, slender form. In addition, several well-preserved florets (intact with grains) and floret bases are present. Where identifiable, these appear to be of cultivated type (*i.e.* with irregular disarticulation scar).

Wheat grains (*Triticum* L.) are a frequent occurrence, often not closely identifiable to species-level, but assigned to *Triticum* because of a relatively deep ventral groove and short

[642] Jacomet 2008, p.45.

embryo. Several were very well-rounded, and therefore assigned to a free-threshing variety of wheat. In samples <24> and <30>, some wheat grains have been assigned to spelt wheat (*Triticum spelta* L.) on account of their glume impressions, flat ventral side (in profile), and relative parallel-sidedness (in ventral view).

The occurrence of wheat chaff in some samples allows more specific information to be obtained. Free-threshing wheat rachis segments, where sufficiently well preserved to allow closer identification, have clean glume scars, curving sides, and flatness (in section), all of which are characteristic of hexaploid bread-type wheat (*Triticum aestivum* L. type). Glume bases and spikelet forks include those of both spelt-type (with marked veining and obtuseness in both keels) and emmer-type (with moderate veining and right-angled primary keel).

A small number of barley and oat grains in samples <24>, <30> and <53> exhibited pronounced dorsal grooving from the embryo end, indicative of germination; this evidence is consonant with Campbell's observation of sprouted barley and oat grains in several samples, which could indicate either spoilage or the production of malt for brewing.[643] This possibility remains to be explored in greater detail in future analysis.

Other crops

Pulses are present in small quantities, including garden pea (*Pisum sativum* L.) distinguishable primarily by its extreme roundedness; broad bean (*Vicia faba* L.), distinguished by its oval form, including some small (<5mm) seeds of comparable type; and indeterminate large legumes which may or may not represent cultivars (*Vicia*/*Lathyrus* L.). Seeds of two other probable cultivars were identified: flax (*Linum usitatissimum* L.) and opium poppy (*Papaver somniferum* L.), both in relatively small quantities. Indeterminate *Linum* L. seeds lacked the characteristic hooked apex of *Linum usitatissimum*, but tend to occur alongside the latter and are

[643] Campbell 2012 pp.8–9.

here thought likely to represent the cultivar. Opium poppy was distinguished from other poppy species primarily by its kidney/crescent-like profile and rounded section.

Wild taxa

Several 'wild' taxa represented in the assemblage, although not considered here as crops, could well have been deliberately gathered or perhaps even managed for use at Lyminge. For example, sedges, bromes and other grasses could have been exploited for fodder, bedding or thatching; while elder (*Sambucus nigra* L.), hazel (*Corylus avellana* L.), hawthorn (*Crataegus monogyna* Jacq.), blackberry (*Rubus fruticosus* L. agg.), raspberry (*Rubus idaeus* L.), dewberry (*Rubus caesius* L.), fat-hen (*Chenopodium album* L.), beet (*Beta vulgaris* L.) and mustards (*Brassica* L.*/Sinapis* L.) are among those which could have served culinary purposes. Most *Brassica/Sinapis* seeds lack a sufficiently well preserved seed-coat to permit more specific identification, although two seeds in sample <24> have been tentatively ascribed to black mustard (*cf. Brassica nigra* (L.) W.D.J. Koch).

Most of the remaining taxa could plausibly represent arable weeds accidentally harvested with the cereals. Few wild taxa, with the occasional exception of brome (*Bromus hordeaceus* L./*secalinus* L.), occur in great abundance; various grasses (including *Lolium* L./*Festuca* L.) appear to be relatively well represented in sample <24>, but few could be identified to species-level within the time available.

Results: sample attributes

The state of preservation of charred plant macrofossils in the samples/bags is assessed in Table 2; abundance and average density are detailed in Tables 3 and 4. It can thus be seen that all ten samples, and all but two bags, are considered numerically sufficient for quantitative analysis, by the criteria of this project (≥30 items).

Preservation, abundance and average density vary considerably both within and between samples. However, certain samples/bags are characterized simultaneously by good preservation, high abundance, and high average density: sample <24> (especially bags 3/6 to 6/6), sample <30> (especially bags 1/4 and 2/4), and bag 4/8 in sample <53>. The correlation between these attributes is unsurprising, since good preservation conditions (*e.g.* reducing atmosphere during charring) attending a given deposit are likely to have increased both the quality and quantity of surviving macrofossils.

The crop component of every sample and bag is dominated by free-threshing cereals, by the criteria set out in the main text (≥80%).[644] It is therefore likely that the remains of glume wheats and other possible crops (pulse, flax, opium poppy) are chance contaminants in what can otherwise be considered free-threshing cereal (FTC) samples; this is not to argue that these taxa were not cultivated at all at Lyminge, but rather that they do not constitute the principal harvested crops in any of the samples studied here.

All of these free-threshing cereal samples are eligible for ratio analysis of crop-processing stages, as developed by G. Jones and outlined in the main text; the results are set out in Table 5–6 and Figure 2.[645] It can be seen that nearly all of the samples are heavily dominated by cereal grain. In addition, samples <05>, <24>, <30> and <53> are eligible for discriminant analysis of

[644] See above, §3.9.3.
[645] See above, §3.9.4; G. Jones 1990.

weed seed types, as developed by G. Jones and outlined in the main text; the other samples have too few classifiable seeds.[646] In this discriminant analysis, as in the ratio analysis, oat caryopses are treated as cereal grains rather than as weed seeds, because of (i) their relative abundance, and (ii) the occurrence of floret bases of cultivated type. The results of the discriminant analysis, and their compatibility with the ratio analysis results, are presented in Table 7 and Figure 3. These results confirm that most of the samples are likely to represent cleaned grain products or, in the case of <53>, grain which had not yet been subject to fine-sieving. Sample <24>, in which chaff elements – including culm (straw) – are relatively well represented, may represent unprocessed ears/sheaves of mixed cereals, as argued in the main text, or else a mixture of different products and by-products.[647]

Finally, the relative proportions of free-threshing cereal grains – barley, wheat, rye and oat – are presented in Table 8 and Figures 4–5. As in the core analyses of this thesis, indeterminate wheat grains have here been treated as if free-threshing, since positively identified glume wheat grains are comparatively very rare.[648]

Conclusion

This appendix has presented the key data pertaining to the Lyminge sub-assemblage analysed for this project. The interpretative significance of these results, in the wider context of Mid Saxon agriculture, is examined in the core analytical chapters of the thesis. The Lyminge samples are there coded with the preface 'LYM'. Thus, for example, sample <24> becomes <LYM24>.

A copy of these results will be lodged with the *Lyminge Archaeological Project* archive.

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[646] See above, §3.9.4; G. Jones 1987.
[647] See above, §6.4.6.
[648] See above, §6.6.2.

Table 2 – Assessment of preservation (after Hubbard & al Azm 1990 p.104, Table 1).

sample	bag	preservation classes represented *perfect……clinkered*					
		1	2	3	4	5	6
<02>	1/8 – 8/8			■	■	■	
<03>	1/1				■	■	
<05>	1/8 – 8/8			■	■	■	
<08>	½				■	■	
<08>	2/2				■	■	
<24>	1/6				■	■	
<24>	2/6				■	■	
<24>	3/6		■	■	■		
<24>	4/6		■	■	■		
<24>	5/6		■	■	■		
<24>	6/6 (A)		■				
<24>	6/6 (B)		■	■	■		
<24>	6/6 (C)		■	■			
<24>	6/6 (D)		■	■	■		
<26>	1/1			■	■	■	
<30>	¼		■	■	■		
<30>	2/4		■	■	■		
<30>	¾			■	■		
<30>	4/4			■			
<42>	1/1			■	■	■	
<53>	1/8			■	■	■	
<53>	2/8			■	■	■	
<53>	3/8			■	■	■	
<53>	4/8		■	■	■		
<53>	5/8				■		
<53>	6/8			■	■	■	
<53>	7/8				■	■	
<53>	8/8				■	■	
<518>	1/1				■	■	

Table 3 – Abundance and average density of charred plant remains in samples.

sample	abundance	average density (items per litre sediment processed)
<02>	780	19.5
<03>	148	29.6
<05>	1,270	31.8
<08>	278	27.8
<24>	14,336	477.9
<26>	100	20.0
<30>	3,201	160.1
<42>	55	11.0
<53>	1,970	49.3
<518>	59	11.8

Table 4 – Abundance and average density of charred plant remains in bags.

sample	bag	abundance	soil vol. (l.)	average density
<08>	1/2	140	5	28.0
<08>	2/2	138	5	27.6
<24>	1/6	158	5	31.6
<24>	2/6	969	5	193.5
<24>	3/6	4,644	5	928.8
<24>	4/6	2,420	5	484.0
<24>	5/6	2,884	5	576.8
<24>	6/6 (A-D)	3,261	5	652.2
<30>	1/4	869	5	173.8
<30>	2/4	1,076	5	215.2
<30>	¾	1,254	5	250.8
<30>	4/4	2	5	0.4
<53>	1/8	90	5	18.0
<53>	2/8	268	5	53.6
<53>	3/8	86	5	17.2
<53>	4/8	567	5	113.4
<53>	5/8	6	5	1.2
<53>	6/8	488	5	97.6
<53>	7/8	263	5	52.6
<53>	8/8	202	5	40.4

Table 5 – Ratio analysis of samples.

sample	% grain	% rachis	% weed seed	total	class
<02>	98.9		1.1	377	FSP
<03>	97.3		2.7	147	FSP
<05>	95.3	0.3	4.4	1,228	FSP
<08>	98.5		1.5	270	FSP
<24>	64.1	5.6	30.3	5,635	USG/MS
<26>	99.0		1.0	100	FSP
<30>	87.7		12.3	1,950	FSP
<42>	86.7		13.3	30	FSP
<53>	71.5	0.1	28.4	1,818	USG
<518>	100.0			59	FSP

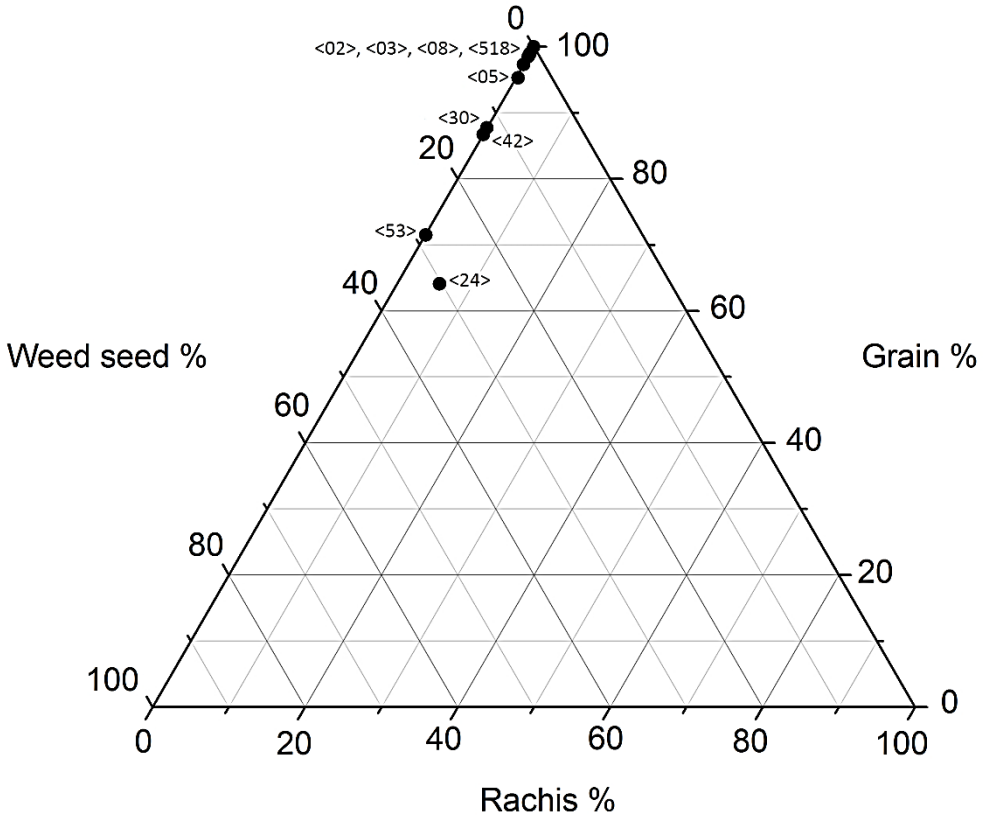


Figure 2 – Triplot displaying results of ratio analysis of samples.

Table 6 – Ratio analysis of individual bags.

sample	bag(s)	% grain	% rachis	% weed	total	class
<02>	1/8 – 8/8	98.9		1.1	377	FSP
<03>	1/1	97.3		2.7	147	FSP
<05>	1/8 – 8/8	95.3	0.3	4.4	1,228	FSP
<08>	1/2	100.0			140	FSP
<08>	2/2	96.9		3.1	130	FSP
<24>	1/6	10.1	1.4	88.4	138	FSBP
<24>	2/6	26.7	14.9	58.4	812	MS
<24>	3/6	66.2	3.4	30.4	1,110	USG
<24>	4/6	73.8	1.7	24.4	1,147	USG
<24>	5/6	32.9	21.1	46.0	635	MS
<24>	6/6 (A-D)	88.6	0.1	11.3	1,793	FSP
<26>	1/1	99.0		1.0	100	FSP
<30>	1/4	86.1		13.9	833	FSP
<30>	2/4	90.5		9.5	516	FSP
<30>	3/4	87.8		12.2	599	FSP
<30>	4/4	50.0		50.0	2	n/a
<42>	1/1	86.7		13.3	30	FSP
<53>	1/8	66.3		33.7	86	USG
<53>	2/8	75.1		24.9	241	USG
<53>	3/8	74.2		25.8	66	USG
<53>	4/8	67.8		32.2	552	USG
<53>	5/8	100.0			6	n/a
<53>	6/8	77.6	0.2	22.2	451	USG
<53>	7/8	66.7		33.3	237	USG
<53>	8/8	69.8		30.2	179	USG
<518>	1/1	100.0			59	FSP

Table 7 – Results of discriminant analysis of weed seed types.

sample	probability	discriminant functions		discriminant analysis classification	ratio classification	compatible classification
		function 1	function 2			
<05>	0.88	-3.08	-0.56	FSP	FSP	**FSP**
<24>	0.59	-3.32	-1.20	FSP/USG	MS/USG	**MS/USG**
<30>	0.95	-3.74	-0.56	FSP/USG	FSP	**FSP**
<53>	0.73	-3.08	-1.43	FSBP	USG	**USG**

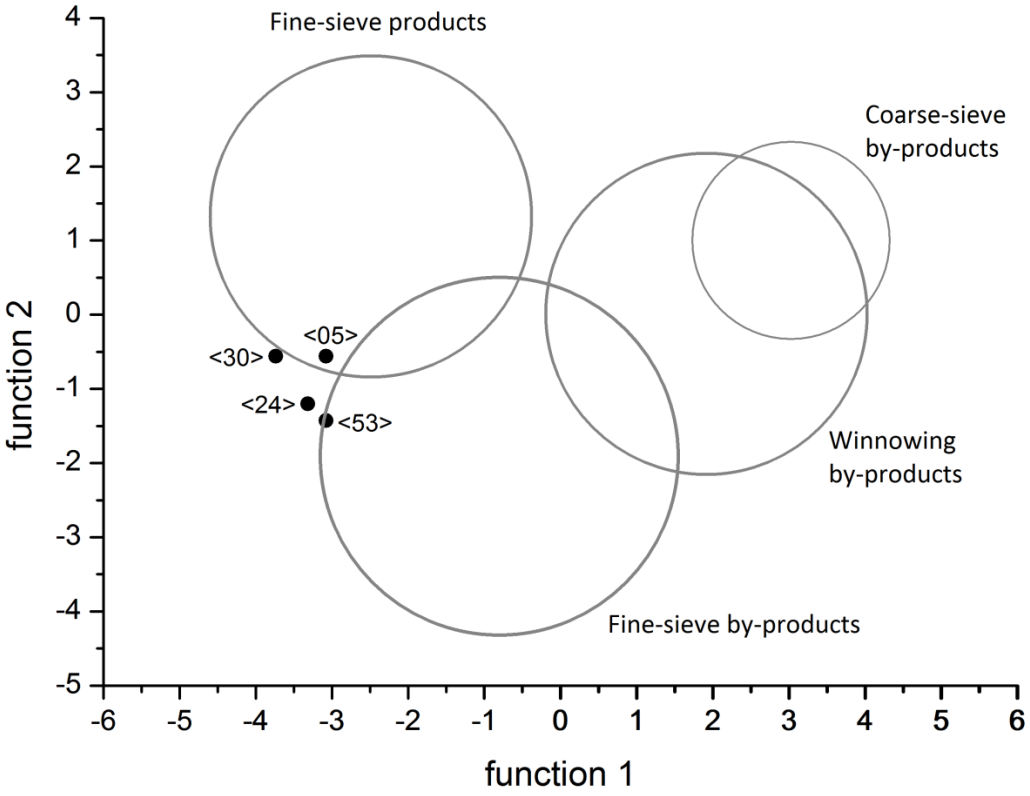


Figure 3 – Scatterplot displaying results of discriminant analysis of weed seed types.

Table 8 - Relative proportions of free-threshing cereal grain in samples and bags.

sample	bag(s)	% free-threshing cereal grain				total
		barley	wheat	rye	oat	
<02>	1/8–8/8	9.7	77.8		12.6	207
<03>	1/1	76.0	15.0	1.0	8.0	100
<05>	1/8–8/8	18.7	71.6	0.3	9.5	729
<08>	1/2–2/2	56.3	40.5		3.2	126
<08>	1/2	48.5	50.0		1.5	66
<08>	2/2	65.0	30.0		5.0	60
<24>	1/6–6/6	15.6	20.9	14.1	49.4	2437
<24>	1/6	-	-	-	-	3
<24>	2/6	3.8	40.4	11.5	44.2	52
<24>	3/6	14.5	16.1	13.6	55.8	509
<24>	4/6	16.8	21.6	17.3	44.3	560
<24>	5/6	6.8	45.8	10.2	37.3	59
<24>	6/6 (A-D)	16.4	20.5	13.2	49.8	1254
<26>	1	78.7	14.6		6.7	89
<30>	1-4	17.7	21.2	34.4	26.7	1331
<30>	1/4	19.4	19.1	41.4	20.1	556
<30>	2/4	13.9	11.1	41.5	33.5	316
<30>	3/4	18.1	30.7	21.1	30.1	459
<30>	4/4	-	-	-	-	0
<42>	1/1	16.7	77.8		5.6	18
<53>	1/8–8/8	80.5	13.6	0.3	5.6	734
<53>	1/8	79.4	8.8	2.9	8.8	34
<53>	2/8	77.2	18.5		4.3	92
<53>	3/8	56.5	39.1		4.3	23
<53>	4/8	86.5	6.9	0.4	6.1	245
<53>	5/8	-	-	-	-	6
<53>	6/8	77.8	18.2		4.0	198
<53>	7/8	86.6	7.3		6.1	82
<53>	8/8	74.1	20.4		5.6	54
<518>	1/1	48.8	41.9		9.3	43

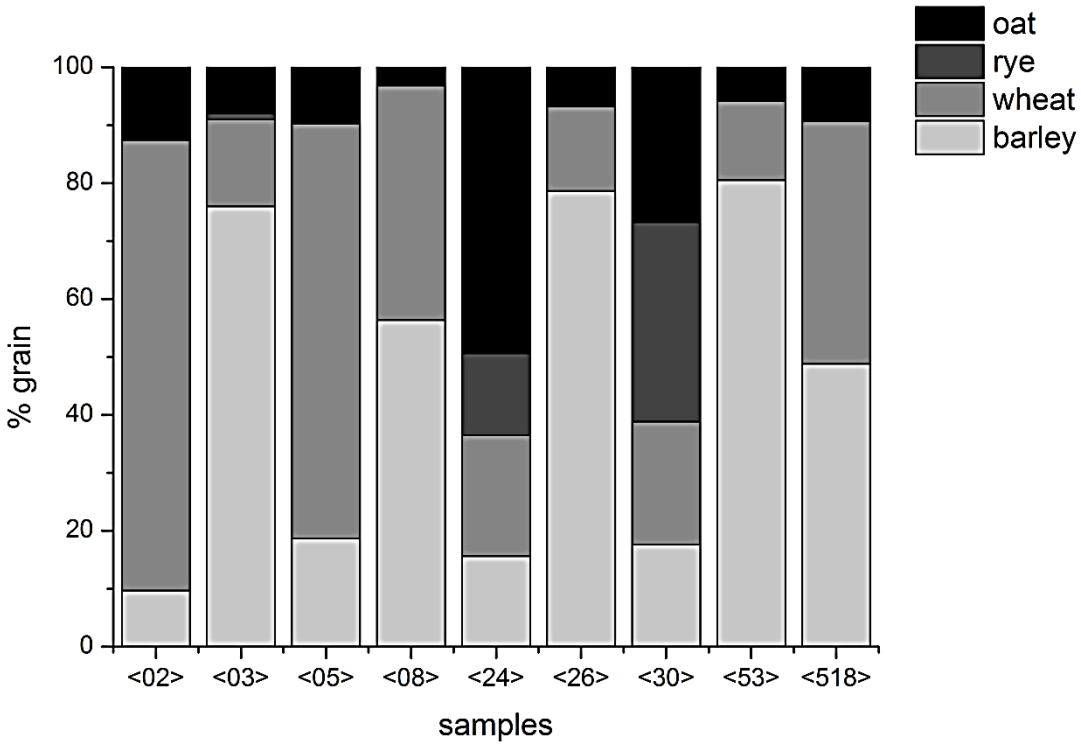


Figure 4 – Relative proportions of free-threshing cereal grain in samples.

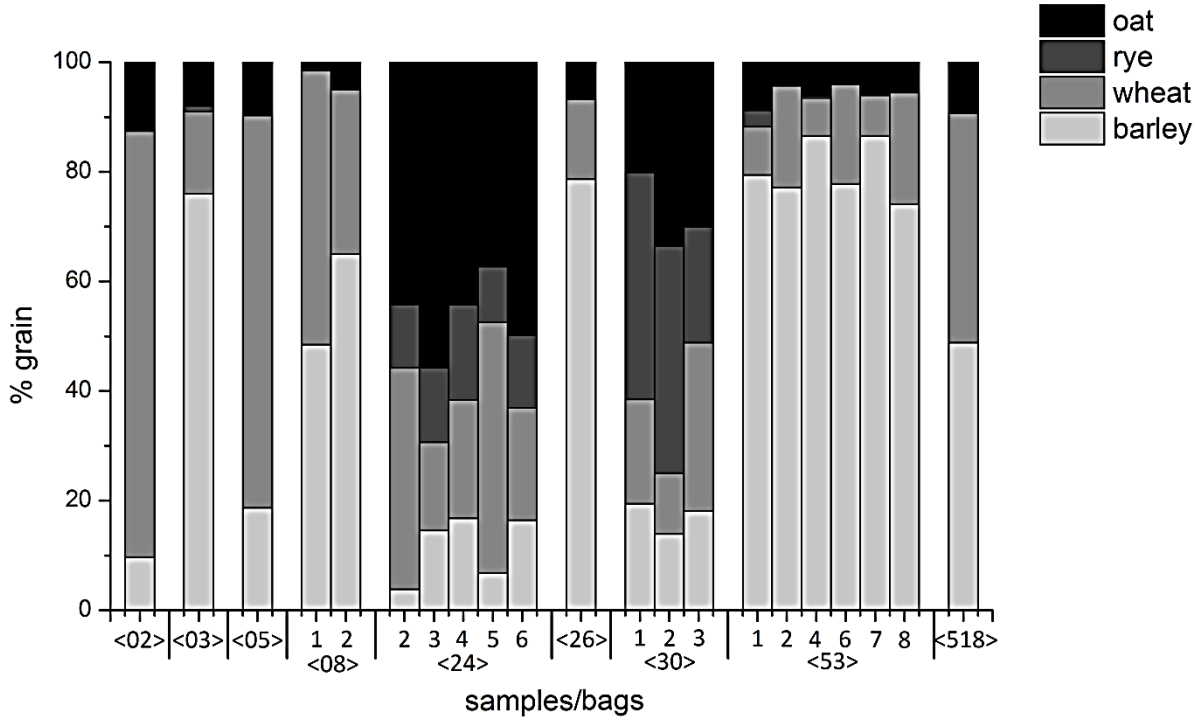


Figure 5 – Relative proportions of free-threshing cereal grain in samples/bags.

Data

Table 9 – Quantitative results of archaeobotanical analysis.

sample	<02>	<03>	<05>	<08>	
bag(s)	1-8/8	1/1	1-8/8	1/2	2/2
volume (l.)	40	5	40	5	5
% flot sorted	50	100	100	100	100
Cereals					
Hordeum L. (Barley)	20	73	126+2cf.	26	34
Hordeum L. hulled (Hulled barley)		3cf.	5+1cf.	6	5
Hordeum L. hulled twisted (Hulled barley)			2		
Avena L. (Oat)	13+13cf.	1+7cf.	55+14cf.	1	3cf.
Secale cereale L. (Rye)		1cf.	2cf.		
Triticum L./*Secale* L. (Wheat/Rye)	2				1
Triticum L. free-threshing (Free-threshing wheat)	91	14+1cf.	313	15+18cf.	15+3cf.
Triticum L. free-threshing fused grains (2 per count)			2		
Triticum L. rachis node (Wheat indet.)			3		
Triticum spelta L. glume base (Spelt)			3+1cf.		
Triticum L. (Wheat indet.)	70		205		
Triticum L. basal rachis node (Wheat indet.)			1		
Cereal indet.	164	43	441	74	65
Cereal-type culm node			5		
Cereal-type culm internode fragment			12		
Cereal-type culm base			2		
Linaceae					
Linum usitatissimum L. (Flax)			1		
Linum L. (Flaxes)			1		
Fabaceae					
Pisum sativum L. (Garden Pea)			1cf.		1cf.
Vicia faba L. (Broad Bean)			1		
Vicia faba L., <5mm (Broad Bean)			1		
Vicia L./*Lathyrus* L., >2mm (Vetches/Peas)	1	1	1		2
Vicia L./*Lathyrus* L., <2mm (Vetches/Peas)			1		1
Orobanchaceae					
Euphrasia L./*Odontites* Ludw. (Eyebrights/Bartsias)			1		
Rubiaceae					
Galium aparine L. (Cleavers)			6+2cf.		
Rosaceae					
Crataegus monogyna Jacq. (Hawthorn)			1		
Rubus fruticosus L. agg. (Blackberry)			1		
Malavaceae					
Malva L.. (Mallow)			3		

sample	<02>	<03>	<05>	<08>	
bag(s)	1-8/8	1/1	1-8/8	1/2	2/2
Asteraceae					
Anthemis cotula L. (Stinking Chamomile)			7		
Poaceae					
Lolium temulentum L. (Darnel)					1cf.
Poaceae, ≤1mm (Small-seeded grasses)		2	7		
Poaceae, 1-2mm (Medium-seeded grasses)			1		
Poaceae, >2mm (Large-seeded grasses)			2		
Bromus hordeaceus L./*secalinus* L. (Soft-brome/Rye-brome)	2		9+4cf.		
Brassicaceae					
Brassica L./*Sinapis* L. type (Cabbages/Mustards)			1		
Polygonaceae					
Rumex L., trigonous (Docks)			1		
Polygonum L. (Knotgrasses)		1	3		
Caryophyllaceae					
Agrostemma githago L. (Corncockle)	1		1		
Cyperaceae					
Eleocharis R. Br. type (Spike-rushes)			1		
Scirpus sylvaticus L. type (Wood Club-rush)			1		
Amaranthaceae					
Beta vulgaris L., c.2mm diameter (Beet)			1		
Chenopodium L. (Goosefoot)			1		
Betulaceae					
Corylus avellana L. nutshell fragment (Hazel)	4		62+1cf.		
Indeterminate					
Small seed indet., <1mm	13	1	8		
Medium seed indet., 1-2mm			18		3
Large seed indet., >2mm					4
Fruitstone/nutshell fragment	3				1
fungal spore					1
stalk indet.	x				
TOTAL (excl. frags)	390	148	1,272	140	139
Average density	19.5	29.6	31.8	28	27.8
charcoal >2mm (approx. ml.)	30	5	25	7	2
shell	x	x	x	x	x
bone	x		x		
insect		x			x
coleoptera					x
large burnt concretions			x		

sample	<24>								
bag	1/6	2/6	3/6	4/6	5/6	A	B	C	D
volume (l.)	5	5	5	5	5	5			
% flot sorted	100	100	25	50	25	100	100	25	100
Cereals									
Hordeum L. (Barley)		2	43	55	1cf.		70	36	21
Hordeum L. germinated								2cf.	
Hordeum L. small grain								1	1
Hordeum L. hulled (Hulled barley)			24	25+8cf.	3cf.		32	21	19
Hordeum L. hulled germinated									2cf.
Hordeum L. hulled twisted			6	2cf.					
Hordeum L. hulled small grain				3					
Hordeum L. hulled grain in floret			1	1					1
Hordeum L. rachis node				2	13				
Hordeum L. lemma base	1								
Avena L. (Oat)	1	23	277	241	22	230	142	181	69
Avena L. germinated									1cf.
Avena L. small grain			3cf.	3cf.					
Avena L. cultivar-type floret base	7	26	7	10	22		5	2	12
Avena L. cultivar-type grain in floret			3	1					1
Avena L. grain in floret			1	3					1
Avena L. glume	1cf.								
Secale cereale L. (Rye)		4+2cf.	61+8cf.	92+5cf.	6	1	77+15cf.	43+3cf.	27
Triticum L. free-threshing (Free-threshing wheat)			46+32cf.	55	8+16cf.		61	23	22
Triticum L. free-threshing small grain		5cf.		8cf.	3cf.		3cf.	3cf.	2cf.
Triticum aestivum L. type rachis node (Bread-type wheat)	2	60	23	13	80		1		
Triticum L. rachis node (Wheat indet.)		61	12	4	33				
Triticum L. rachis internode		16	5		5				
Triticum spelta L. glume base (Spelt)	1	5		2	3cf.				
Triticum spelta L.				2cf.				2cf.	4cf.
Triticum dicoccum Schübl. spikelet fork (Emmer)		1cf.							
Triticum dicoccum Schübl./*spelta* L. glume base				1					
Triticum dicoccum Schübl./*spelta* L. (Emmer/spelt)							4cf.		
Triticum L. (Wheat indet.)	2	16	4	58		1	76	24	42
Triticum L. spikelet fork		3	1		1				
Triticum L. basal rachis node			2						
Cereal indet.	11	165	226	287	150		254	77	3
Cereal-type culm node	11	55	5	11	21				23
Cereal-type culm internode fragment	20	48	6	9	34				16
Cereal-type rachis node					3				
Cereal-type culm base	3	18		1	3				3

sample	<24>								
bag	1/6	2/6	3/6	4/6	5/6	A	B	C	D
Linaceae									
Linum usitatissimum L. (Flax)	1	15	14	6	18		5	1	
Linum L. (Flaxes)				2+1cf.	5				
Fabaceae									
Pisum sativum L. (Garden Pea)			1cf.				1cf.		
Vicia faba L. (Broad Bean)									1
Vicia faba L., <5mm (Broad Bean)		2	2						
Vicia L./*Lathyrus* L., >2mm (Vetches/Peas)					1		2	1	
Vicia L./*Lathyrus* L., <2mm (Vetches/Peas)		1							
Papaveraceae									
Papaver somniferum L. (Opium Poppy)		1		1					
Papaver argemone L. (Prickly Poppy)	1								
Papaver rhoeas L. (Common Poppy)				1cf.					
Papaver L. (Poppy)		1							
Orobanchaceae									
Euphrasia L./*Odontites* Ludw. (Eyebrights/Bartsias)	3	12		4	1				
Rubiaceae									
Galium aparine L. (Cleavers)	1	5	30	12+1cf.	13			5	22
Galium verum L. (Lady's Bedstraw)		1cf.		7cf.	1cf.				
Galium L. (Bedstraws)		2	29	11	16			4	10
Rosaceae									
Rubus fruticosus L. agg. (Blackberry)					2cf.				
Malavaceae									
Malva sylvestris L. (Common Mallow)		6+1cf.		1	4				
Malva L.. (Mallow)		5	3	2	6				
Asteraceae									
Anthemis cotula L. (Stinking Chamomile)	3	6	3		3				1
Carduus L./*Cirsium* Mill. (Thistles)				1	2				
Lapsana communis L. (Nipplewort)	1	6	3	1	7				
Sonchus asper (L.) Hill (Prickly Sowthistle)	6	2cf.							
Poaceae									
Lolium L./*Festuca* L. (Rye-grasses/Fescues)		78	29+1cf.	18	50		3	2	
Poaceae, ≤1mm (Small-seeded grasses)	88	135	77	51	22				
Poaceae, 1-2mm (Medium-seeded grasses)		22	1	8	14		1		
Poaceae, 1-2mm seed in floret		1		1					
Poaceae, >2mm (Large-seeded grasses)		30	10	28	42			3	
Anisantha sterilis (L.) Nevski (Barren Brome)		7	1		3		1		
Bromus L./*Anisantha* K. Koch (Bromes/Barren Bromes)		2	2	1					
Bromus hordeaceus L./*secalinus* L. (Soft-brome/Rye-brome)	3	70	97	84	35	16	52	29	26
Bromus arvensis L. (Field Brome)		1cf.			4cf.				
Bromus L. (Bromes)		3	2cf.	3	4+11cf.			10	

sample	<24>								
bag	1/6	2/6	3/6	4/6	5/6	A	B	C	D
Ranunculaceae									
Ranunculus acris L./*bulbosus* L./*repens* L. (Meadow/Bulbous/Creeping Buttercup)		4	4		1				
Brassicaceae									
Brassica nigra (L.) W.D.J. Koch (Black Mustard)					2cf.				
Brassica L./*Sinapis* L. type (Cabbages/Mustards)		23	17	17	9				
Polygonaceae									
Polygonaceae, trigonous (Knotweeds)				1					
Rumex L., trigonous (Docks)		9	1	2	3				
Polygonum L., trigonous (Knotgrasses)		4	4		9				
Caryophyllaceae									
Agrostemma githago L. (Corncockle)	2	13	11+1cf.	15	20		8	3	3
Caryophyllaceae (Pink family)		1	2						1
Silene L. (Campions)					1cf.				
Cyperaceae									
Carex L. type (Sedges)		8	2	2	3				
Cyperaceae (Sedge family)		6							
Eleocharis R. Br. type (Spike-rushes)	12	8	6	3					
Scirpus sylvaticus L. type (Wood Club-rush)		1		2	1				
Amaranthaceae									
Amaranthaceae (Goosefoot family)				3	4				
Beta vulgaris L., *c.*2mm diameter (Beet)	1								
Chenopodium L. (Goosefoot)	1cf.		1cf.						
Betulaceae									
Corylus avellana L. nutshell fragment (Hazel)	2	2cf.	2cf.	5					
Indeterminate									
Small seed indet., <1mm		9	4	10	8				
Medium seed indet., 1-2mm		26	7	8	12				
Large seed indet., >2mm		10	8	6			3	2	
Fruitstone/nutshell fragment			2						
fungal spore	6	10	13	10	2				
stalk indet.									
TOTAL (excl. frags)	169	1009	1176	1217	732	248	816	478	318
Average density	33.8	201.8	940.8	486.8	585.6	?	?	?	?
charcoal >2mm (approx. ml.)	12	15	1.5	8	10		0.4	0.25	
shell	x	x							
bone	x								
animal dung	x								
daub	x								

sample	<26>	<30>				<42>
bag	1/1	1/4	2/4	3/4	4/4	1/1
volume (l.)	5	5	5	5	5	5
% flot sorted	100	100	50	50	100	100
Cereals						
Hordeum L. (Barley)	1	26	20	22		3
Hordeum L. germinated		3cf.				
Hordeum L. hulled (Hulled barley)	67	70	23	58		
Hordeum L. hulled germinated		6cf.		3cf.		
Hordeum L. hulled twisted	2	3	1			
Hordeum vulgare L. (lax-eared)/*distichon* L. lemma base		1				
Avena L. (Oat)	6	95+10cf.	95+2cf.	131		1cf.
Avena L. germinated		4cf.	7cf.	1cf.		
Avena L. cultivar-type floret base			3	8		
Avena L. cultivar-type grain in floret		3	1	6		
Avena L. grain in floret			1			
Secale cereale L. (Rye)		219+11cf.	131	97		
Triticum L./*Secale* L. (Wheat/Rye)			2			
Triticum L. free-threshing (Free-threshing wheat)	6	54	28	136		25
Triticum spelta L. glume base (Spelt)			2			
Triticum spelta L.			1cf.			
Triticum dicoccum Schübl./*spelta* L. glume base (Emmer/Spelt)			1			
Triticum dicoccum Schübl./*spelta* L. terminal glume base			1			
Triticum L. (Wheat indet.)	7	52	7	5		14
Triticum L. spikelet fork		1				
Cereal indet.	10	161	149	67	1	8
Cereal-type culm internode fragment			1			
Linaceae						
Linum usitatissimum L. (Flax)			1			
Linum L. (Flaxes)		1cf.				
Fabaceae						
Vicia L./*Lathyrus* L., >2mm (Vetches/Peas)				1		2
Vicia L./*Lathyrus* L., <2mm (Vetches/Peas)		1				
Medicago L./*Melilotus* Mill./*Trifolium* L. (Medicks/Melilots/Clovers)				2		
Orobanchaceae						
Euphrasia L./*Odontites* Ludw. (Eyebrights/Bartsias)						1
Rubiaceae						
Galium aparine L. (Cleavers)		2	2			
Galium L. (Bedstraws)		2	1			
Rosaceae						
Rubus idaeus L. (Raspberry)		1				
Rubus fruticosus L. agg. (Blackberry)		6	1	1		
Rubus L. (Brambles)		1				

sample	<26>	<30>				<42>
bag	1/1	1/4	2/4	3/4	4/4	1/1
Asteraceae						
Anthemis cotula L. (Stinking Chamomile)		1	2	3		
Achillea L./*Anthemis* L./*Artemisia* L./*Tripleurospermum* Sch. Bip. (Yarrows/Chamomiles/Mugworts/Mayweeds)		2				
Crepis capillaris (L.) Wallr. (Smooth Hawk's-beard)			1cf.			
Lapsana communis L. (Nipplewort)		2				
Poaceae						
Lolium temulentum L. (Darnel)		1cf.				
Lolium L./*Festuca* L. (Rye-grasses/Fescues)		4	2			
Poaceae, ≤1mm (Small-seeded grasses)		16		7		
Poaceae, 1-2mm (Medium-seeded grasses)				2	1	
Poaceae, >2mm (Large-seeded grasses)				2		
Avena L./*Bromus* L. (Oats/Bromes)		9		2		
Bromus hordeaceus L./*secalinus* L. (Soft-brome/Rye-brome)	1cf.	43+1cf.	30	32		
Ranunculaceae						
Ranunculus acris L./*bulbosus* L./*repens* L. (Meadow/Bulbous/Creeping Buttercup)				1		
Brassicaceae						
Brassica nigra (L.) W.D.J. Koch (Black Mustard)				1cf.		
Brassica L./*Sinapis* L. type (Cabbages/Mustards)		2				
Polygonaceae						
Polygonaceae, trigonous (Knotweeds)		6cf.				
Rumex L., trigonous (Docks)				1		
Rumex acetosella L. (Sheep's Sorrel)		1				
Polygonum L., trigonous (Knotgrasses)		1				
Polygonum aviculare L. (Knotgrass)		1				
Fallopia convolvulus (L.) Á. Löve type (Black-bindweed)		1				
Caryophyllaceae						
Agrostemma githago L. (Corncockle)		13	8	14		
Caryophyllaceae (Pink family)		1	1			
Cyperaceae						
Carex L., type (Sedges)		1				1
Eleocharis R. Br., type (Spike-rushes)				1		
Amaranthaceae						
Amaranthaceae (Goosefoot family)			2			
Atriplex patula L./*prostrata* Boucher ex DC. (Common/Spear-leaved Orache)				1		
Chenopodium album L. (Fat-hen)		2				
Chenopodium L. (Goosefoot)		3		3cf.		
Indeterminate						
Small seed indet., <1mm		7	5	10		
Medium seed indet., 1-2mm		11	2	1		
Large seed indet., >2mm		4	3	2		

sample	<26>	<30>				<42>
bag	1/1	1/4	2/4	3/4	4/4	1/1
fungal spore		4	3	1	6	
stalk indet.		x				
TOTAL (excl. frags)	100	870	539	622	8	55
Average density	20	174	215.6	248.8	1.6	11
charcoal >2mm (approx. ml.)	0.1	10	25	13	3.5	1
shell	x		x	x	x	x
bone		x	x			
insect				x		
tooth				x		

sample	<53>								<518>
bag	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8	1/1
volume (l.)	5	5	5	5	5	5	5	5	5
% flot sorted	100	100	100	100	100	100	100	100	100
Cereals									
Hordeum L. hulled (Hulled barley)	9+3cf.	20+4cf.	5	34		31	14	4	2cf.
Hordeum L. hulled germinated			1cf.						
Hordeum L. hulled twisted				2cf.					
Hordeum L. hulled straight							2cf.		
Hordeum L. (Barley)	15	47	7	176	3	122	55	36	19
Avena L. (Oat)	2+1cf.	4	1	15	2cf.	7	5	3	2+2cf.
Avena L. small grain						1cf.			
Secale cereale L. (Rye)	1cf.			1cf.					
Triticum L./*Secale* L. (Wheat/Rye)						3	1	1	
Triticum L. free-threshing (Free-threshing wheat)	3	12	3+6cf.	11		36	1+2cf.	6	15+3cf.
Triticum aestivum L. type rachis node (Bread-type wheat)						1			
Triticum spelta L. glume base (Spelt)						2			
Triticum L. (Wheat indet.)		5		6	1	10	3	5	
Cereal indet.	23	89	26	129		149	75	70	16
Cereal-type culm node		1	2	2			1	2	
Cereal-type culm internode fragment		7	1			1	1	1	
Cereal-type culm base		1	1	1					
Linaceae									
Linum L. (Flaxes)			1cf.						
Fabaceae									
Pisum sativum L. (Garden Pea)		1+1cf.	5			2cf.	2cf.	1	
Vicia L./*Lathyrus* L., >2mm (Vetches/Peas)	1					2		2	
Vicia L./*Lathyrus* L., <2mm (Vetches/Peas)				2					
Medicago L./*Melilotus* Mill./*Trifolium* L. (Medicks/Melilots/Clovers)								1	

sample	<53>								<518>
bag	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8	1/1
Caprifoliaceae									
Sambucus nigra L. (Elder)		4	2					1	
Papaveraceae									
Papaver somniferum L. (Opium Poppy)				2					
Papaver argemone L. (Prickly Poppy)							1		
Orobanchaceae									
Euphrasia L./*Odontites* Ludw. (Eyebrights/Bartsias)							1	1	
Rubiaceae									
Galium aparine L. (Cleavers)	2+3cf.	3+4cf.	4+1cf.	2			1cf.	1+1cf.	
Galium L. (Bedstraws)				2			1		
Rosaceae									
Rubus fruticosus L. agg. (Blackberry)						1			
Rubus caesius L. (Dewberry)						1cf.			
Asteraceae									
Anthemis cotula L. (Stinking Chamomile)	2	3		3		5	3	1	
Lapsana communis L. (Nipplewort)		1cf.							
Poaceae									
Lolium L./*Festuca* L. (Rye-grasses/Fescues)			1	7		4			
Poaceae, ≤1mm (Small-seeded grasses)	4	9		35		15	20	11	
Poaceae, 1-2mm (Medium-seeded grasses)	1		3			2	2	3	
Poaceae, >2mm (Large-seeded grasses)		2	1	7		6	2	6	
Avena L./*Bromus* L. (Oats/Bromes)				8					
Bromus hordeaceus L./*secalinus* L. (Soft-brome/Rye-brome)	11+1cf.	22+1cf.	3	80		40	27	15	
Bromus arvensis L. (Field Brome)				1cf.			3cf.		
Bromus L. (Bromes)						1cf.		1cf.	
Ranunculaceae									
Ranunculus acris L./*bulbosus* L./*repens* L. (Meadow/Bulbous/Creeping Buttercup)				1		1			
Brassicaceae									
Brassica nigra (L.) W.D.J. Koch (Black Mustard)							6cf.		
Brassica L./*Sinapis* L. type (Cabbages/Mustards)		7		14		14			
Polygonaceae									
Polygonaceae, trigonous (Knotweeds)		5		7		4		3	
Rumex L., trigonous (Docks)		1	4			3			
Polygonum L., trigonous (Knotgrasses)							3		
Caryopyhllaceae									
Silene L. (Campions)		1cf.							
Cyperaceae									
Carex L. type (Sedges)	3	1		7		2	6	6	
Cyperaceae (Sedge family)								2	
Eleocharis R. Br. type (Spike-rushes)						1	1		

sample	<53>								<518>
bag	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8	1/1
Amaranthaceae									
Chenopodium L. (Goosefoots)	1			1					
Chenopodium album L. (Fat-hen)				1			2		
Betulaceae									
Corylus avellana L. nutshell fragment (Hazel)			1					1cf.	
Indeterminate									
Small seed indet., <1mm	1	10		1		9	10	6	
Medium seed indet., 1-2mm	3	10	7	6		12	10	12	
Large seed indet., >2mm			3	4		1	1	1	
fungal spore	5	8		98	1	32	39	14	
stalk fragments				x					x
TOTAL (excl. frags)	95	277	87	666	7	520	300	216	60
Average density	19	55.4	17.4	133.2	1.4	104	60	43.2	12
charcoal >2mm (approx. ml.)	12	23	46	11	4	10	11	12	8
shell	x	x	x	x	x	x	x	x	x
bone	x	x	x					x	x
insect									x
coleoptera	x								
tooth	x								

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