Society of Antiquaries of Scotland

The Traprain Law Environs Project

Fieldwork and Excavations 2000-2004

Colin Haselgrove

ISBN: 978-0-903903-46-2 (hardback) • 978-1-908332-30-1 (PDF)

Haselgrove, Colin 2009 *The Traprain Law Environs Project: Fieldwork and Excavations 2000-2004*. Edinburgh: Society of Antiquaries of Scotland. https://doi.org/10.9750/9781908332301

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Chapter 8

Environment and subsistence economy: the charred and waterlogged plant remains and animal bones

JACQUELINE HUNTLEY and CHARLOTTE O'BRIEN
(with a contribution by Louisa Gidney)

INTRODUCTION

A key objective of the TLEP concerned reconstructing the agricultural economy of enclosed settlements in the region and how this changed over the lifetime of the excavated sites. In the anticipation that sub-soil acidity would minimise the recovery of faunal remains, particular emphasis was placed on the recovery of charred plant remains, both in order to permit the investigation of changes in crop husbandry and spatial patterning on individual sites, and to retrieve material suitable for radiocarbon dating. As in the earlier excavations at Fishers Road East (Huntley 2000), the intention was to exploit the possibility of directly dating plant remains, as well as to obtain an absolute dating framework for the sites.

The methodology of the environmental research programme is set out first, after which the archaeobotanical evidence from Whittingehame Tower, Standingstone and Knowes is described, followed by the data from the evaluations. The very few faunal remains from the TLEP sites are then presented, prior to an overall synthesis of the evidence.

Sampling methodology

To maximise possibilities both for palaeobotanical research and radiocarbon dating, a blanket sampling policy was applied on each of the TLEP excavations. Bulk soil samples were taken from all significant features and deposits, and were processed in Durham. Wherever possible a sample of 20–30 litres was retained for each context, although smaller features such as post-holes even in their entirety often yielded far lower volumes. This procedure of sampling even small features paid off at Standingstone, where an otherwise undistinguished post-hole proved to contain a cache of grain. Occasional larger samples were taken where features appeared to contain a higher than average incidence of burnt material. Waterlogged deposits were encountered at East Bearford and Knowes.

All samples were manually floated and sieved through a 500μm mesh. Initially, 5-litre sub-samples were processed to permit a quick assessment of the samples to enable effort to be focussed on samples containing enough material to warrant further processing. Other samples were targeted for full analysis to see whether dateable material could be obtained from them. In most cases, this procedure identified a good spread of samples for full analysis, but at Whittingehame Tower – the first major excavation processed – a high proportion of the initial 5-litre samples were barren. Consequently, a random 15% of samples were selected for full processing as a control. Both flots and residues were retained to 500μm. The >10mm fractions of residues were scanned for charred remains and any artefacts before being discarded, acting as a further control on material recovery rates.

After drying, the flots were scanned under a stereomicroscope at magnifications of up to ×50, notes made of the matrix components and any seeds or identifiable plant remains sorted and identified by comparison with modern reference material held in the Department of Archaeology, Durham University. Unless otherwise stated, the whole flot was sorted. Nomenclature for non-cereal taxa follows Stace (1997). For all sites, concentrations of seeds were standardised to 100 litres processed, thus avoiding fractional values produced with the more usual seeds per litre. In the tables, the identified remains are allocated an ecological code; the first letter denotes whether they are c = charred or w = waterlogged, the second indicates their habitat: a = arable; c = cultivated/grain; g = grassland; h = heath; m = maritime; r = ruderal; s = chaff; t = tree/shrub; w = wetland; x = broad niche.

The majority of the radiocarbon dates obtained for the TLEP sites are on charred material retrieved from the environmental samples, although due to poor preservation, the proportion of dates on cereals is lower than originally envisaged (Chapter 9). Larger pieces of wood charcoal recognised on site were separately

collected in order to investigate the utilisation of local wood resources, but only Knowes produced a significant quantity of identifiable charcoal; none of the hand-collected samples was used for dating.

WHITTINGEHAME TOWER: THE CHARRED PLANT REMAINS (JPH)

Samples were collected from 74 contexts at Whittingehame. Following the initial assessment, 21 samples were fully processed, but four that produced only the occasional seed were not deemed worth further analysis. Few of the samples targeted for archaeological reasons proved to contain seeds, although charcoal from short-lived woody species was sometimes present. Full data can be found in the site archive.

The charred material was often crazed and highly friable, so that some remains may well have been lost during processing, which was particularly challenging due to the heavy clay – more intractable than on any of the other TLEP sites. Furthermore, cereal grains were generally of a puffed and worn character, although some hulled barley was reasonably well-preserved. All of these point to an assemblage that is more or less certain to be biased, hindering detailed discussion of crop processing stages. Coal, clinker and partially burnt coal remained in many flots and strongly imply the use of coal as a fuel. Charcoal was moderately common as well, at least some of it from smaller roundwood, which might represent kindling or simply tidying up of the site. There is no evidence that peat was used either as a fuel or bedding/roofing material that subsequently got burnt. A very few samples produced fragments of calcined mammal bone.

As noted, an additional 15% sample of contexts with barren 5-litre sub-samples was selected for full processing as a control, using randomly generated lists of numbers. This was done not only to test whether the original approach was valid, but also to see whether the methodology might need to be altered for future TLEP sites, if the project aims were to be adequately addressed. Five of the nine randomly selected 'barren' samples produced no seeds after processing the remaining material (totals 13–24 litres); the other four did produce a few fragments. Their seed concentrations were calculated as between 8 and 48 items per 100 litres, which is very low, but does overlap with the densities in some samples at the 'poorer' end of the range among those initially identified as potentially 'botanically significant', though in the end proving not to contain further material pro rata.

The implication is that, in these latter cases, the occurrence of the occasional one or two fragments in the 5-litre sub-samples was simply by chance. It therefore seems reasonable to conclude that sub-sampling does not lose significant data, whilst gaining in effective processing and scanning of more samples in a given time. It also suggests that many low occurrence samples might not be worth further processing either.

Results

Figure 8.1 presents concentrations of seeds standardised to 100 litres processed as a frequency histogram (the x-axis is non-linear). As is typical with well-sampled sites, the majority have low concentrations and represent contexts away from areas of specific activity or discard of plant remains. In all, 29 contexts

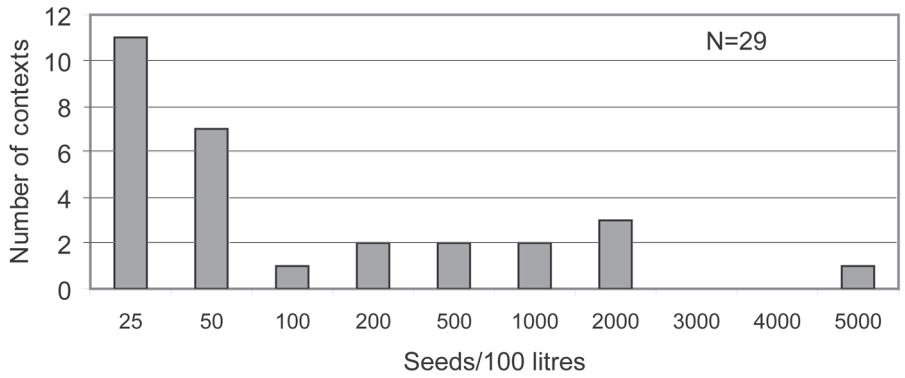

Figure 8.1
Whittingehame: Frequency of seed concentrations

Table 8.1
Whittingehame: percentage occurrence of taxa

ecol	*Taxon*	*count of contexts*	*percentage occurrence*
cc	Cerealia undiff.	20	67
cc	*Hordeum* hulled	13	43
cc	*Hordeum* indet.	9	30
ct	*Corylus avellana* nutshell	9	30
cx	Compositae (immature head)	7	23
cx	Polygonaceae undiff.	6	20
cc	*Avena* grain	5	17
cm	*Fucus* – thallus/frond	5	17
cr	*Rumex obtusifolius*-type	3	10
ca	*Chenopodium album*	3	10
cc	*Triticum dicoccon*	2	6.7
cc	*Triticum* sp(p). grain	2	6.7
cs	*Hordeum* rachis internode	2	6.7
cs	*Triticum* glume	2	6.7
cs	*Avena* awn	2	6.7
ca	*Fallopia convolvulus*	2	6.7
cw	*Carex* (trigonous)	2	6.7
ce	*Pisum sativum*	2	6.7
cg	Poaceae 2–4mm	2	6.7
cs	*Triticum aestivum* internode	1	3.3
cs	*Triticum dicoccon* glume base	1	3.3
cr	Chenopodiaceae undiff.	1	3.3
ch	*Danthonia decumbens*	1	3.3
cs	Culm nodes	1	3.3
cg	*Plantago lanceolata*	1	3.3
ca	*Stellaria media*	1	3.3
ca	*Persicaria lapathifolia*	1	3.3
cw	*Carex* (lenticular)	1	3.3
ca	*Galeopsis tetrahit*	1	3.3
cx	*Bromus* sp(p). grain	1	3.3
cx	Legume < 4mm	1	3.3
ca	*Chrysanthemum segetum*	1	3.3
cx	*Ranunculus repens*-type	1	3.3

contained some charred seeds but only from 33 taxa. Percentage occurrence values were calculated for the assemblage as a whole (Table 8.1). As is clear, few taxa are widespread, most being present in relatively few samples.

Cereal grains comprise 92% of the grain/chaff/weed assemblage; weed seeds are 7% and chaff 1%. Many of the remains are fragmentary or abraded, however, and 'unidentifiable' is the most frequent category, suggesting that material has been lost to an adverse burial environment. The assemblage is thus almost certainly biased and may not represent a fully processed crop, as suggested by the percentage types. Indeterminate cereal grains occur in more than a third of the contexts, followed by *Hordeum* (barley) grains – either clearly hulled or sufficiently abraded as to be classified as undifferentiated. None clearly of naked barley was recorded. Hazel nutshell fragments are also reasonably common. More unexpected were the common fragments of immature heads of Composites – possibly *Anthemis* or more probably *Matricaria* (mayweeds). Whilst they are large and fairly robust, hence more likely to survive, their presence might just indicate threshing debris. However, the culm nodes typical of this processing stage are very rare.

Avena (oat) grains occur in about one fifth of the samples and are the next most abundant cereal after barley, whilst wheat is present in less than 10%. This was somewhat unexpected. Oats typically suggest later material in Scottish or northern English sites (see below). The grains had the characteristic long, V-shaped embryo and thus were not from other large grasses. Chaff was absent and thus they could have been wild oats, *Avena fatua*, but this too is rare on prehistoric sites, making it doubly important for this material to be dated – in the event, only one oat grain could be directly dated (SUERC-10619), but they clearly belong with the latest occupation. Counter to the later date suggested by the oats, emmer wheat (*Triticum dicoccon*) is present, tentatively as grain and definitively as chaff. Single occurrences of bread wheat node plus *Chrysanthemum segetum* (corn marigold) compound the dating issue, as these species tend to be later (or Neolithic, in the case of bread wheat). The two occurrences of *Pisum sativum* (peas) provide slim evidence for another crop plant. The weeds seeds are typical of moist to damp, generally nutrient enriched soils.

Brown seaweed thallus fragments (*Fucus* spp) occurred in a sixth of the samples. This must have been brought from the coast 8km away, and may have been

Table 8.2
Whittingehame Tower botanical data (seeds/100 litres)

		Ditches and palisade							*Pre-cobbles*				*Cobbles*		
	Context number	58	38	103	114	211	65	68	181	233	17	238	123	118	241
	Feature No	F49	F258	F258	F207	F207	F64	F8	F130	F234	F16	F237			F242
ecol	*Volume floated (litres)*	5	12	18	16	17	26	11	13	7	21	5	30	20	5
cc	*Avena* grain														
cc	*Cerealia* undiff.	20					4	9	8				10	10	
cc	*Hordeum* hulled													10	
cc	*Hordeum* indet.	20			6										20
cc	*Triticum dicoccon*											20			
cc	*Triticum* sp(p). grain														
cs	*Avena* awn														
cs	*Hordeum* rachis internode														
cs	*Triticum aestivum* internode									14					
cs	*Triticum dicoccon* glume base														
cs	*Triticum* glume														
cs	Culm nodes														
ca	*Chenopodium album*														
ca	*Chrysanthemum segetum*														
ca	*Fallopia convolvulus*														
ca	*Galeopsis tetrahit*														
ca	*Persicaria lapathifolia*														
ca	*Stellaria media*														
ce	*Pisum sativum*		8												
cg	Poaceae														
cg	*Plantago lanceolata*														
ch	*Danthonia decumbens*														
cm	*Fucus* – thallus/frond														
cr	Chenopodiaceae undiff.														
cr	*Rumex obtusifolius*-type														
ct	*Corylus avellana* nutshell										10		3		20
cw	*Carex* (lenticular)														
cw	*Carex* (trigonous)														
cx	*Bromus* sp(p). grain														
cx	Legume < 4mm														
cx	Polygonaceae undiff.			6					8						
cx	*Ranunculus repens*-type														
wx	Compositae (head/pappus)					18				29	19	20			

Over cobbles			*Pit complex*				*Late post-holes*							
98	52	11	42	106	13	34	183	184	185	194	195	197	206	20
			F86	F85	F12	F33	F182			F193		F196	F205	F19
18	18	36	24	27	1	9	19	10	19	19	3	3	16	7
						68	784	260	126				13	
6	17	92	4	4	200	511	126	160	226	11	2167		6	71
22	83	322			300	1178	1184	530	168	16	2100	67		14
					100	267	200	100					6	29
						11					100			
					100	33								
							16							14
6						11								
						11								
				4										14
							5							
						11	32				33			
				4										
						22		10						
							11							
							32							
							5							
								10						
		3					5							
										5				
						11								
17	278	117							5	5				
		3												
							11			11				43
17	11		4	7		11						33		
					100									
				4	200									
							16							
											233			
		6				11		10	5					
							5							
						22	5		5					

deliberately used as manure. It was also used to produce potash for glass making, but an inland site seems unlikely for such a process when the potash would be more easily transported than the raw material. It has been found both on inland sites in northern England (Huntley and Stallibrass 1995) and commonly occurs on almost all Viking/Norse sites in northern Scotland (Huntley 1992; 1994; 1995).

Table 8.2 presents the botanical data with the samples arranged in appropriate archaeological order. Unfortunately, very little material was found in any of the ditch fills. Only one of seven samples from the outer ditch produced charred cereal [58], consisting of a few fragments of indeterminate cereal and barley grains, although birch [111] and oak charcoal [63] were found in the recut. Similarly, only two of the five samples from the main ditch, both from the recut, contained charred material, this time pea and weed remains in very low concentrations [38, 103], along with more birch charcoal. This lack of material in the ditches is not, however, particularly surprising, if these fills are indeed mainly inwash from the sides and the result of normal processes of erosion. The smaller inner ditch was also largely devoid of material: one of the fills [211] did produce several fragments of an immature Composite head that may have originated in a single item, but the only fill [114] with charred cereal remains is from a point where the ditch was cut through by later features rich in seeds. Attempts at radiocarbon dating the Composite head unfortunately failed through too low a graphite yield, whilst a fragment of parenchymatous tissue submitted from the base of the outer ditch proved to be geological in age (SUERC-10611) indicating that the feature was overdug or the incorporation of older material during the lifetime of the ditch.

Two of the four palisade samples produced occasional indeterminate cereal grains that offered little in the way of interpretation, whilst the features belonging to the earliest occupation in the interior were also relatively unproductive. The few remains from post-hole F234 probably indicate the mixture of general soil with inwash from its sides, although the presence of bread wheat is noteworthy [233]. Post-hole F237 yielded emmer, whilst the fill [17] of scoop F16 contained a few hazel nutshell. All three features contained immature Composite head fragments.

The richer samples all appear to be associated with the phases of occupation post-dating the laying of the cobble surfaces. Few of the samples directly associated with the cobbled area contained plant remains, none in any quantity. The deposits that formed over the cobbled surfaces in the scooped area [11, 52, 98] produced moderate assemblages of indeterminate cereal and barley grain, as expected, but it was also here that nearly all the seaweed survived. Whilst this does not assist in determining the use to which the seaweed was put, it strongly implies that it was a spatially and chronologically restricted activity. As expected given the marine influence, two dates on seaweed from [11] (SUERC-10601; 10605) were older than those on barley and charred hazel nutshell from the same context (SUERC-10599; 10600). The laboratory had expected still earlier dates, but the seaweed was a *Fucus* species; these are not submerged continuously and therefore respire in air, which might alter the marine effect of radiocarbon. From the other pair of dates, this deposit lies between the fourth to sixth centuries cal AD.

Gully F12 and a related post-hole F33 beside pit F85 produced two rich samples [13, 34]. Cereal and barley grains dominated their assemblages and they were the only two contexts on the site to produce wheat grains. [34] produced emmer chaff in limited numbers as well as barley chaff. Oats were moderately common as well. Some considerable amounts of sedge nutlets were retrieved from [13], absent elsewhere except in very low amounts in one context. They may reflect cereals being grown in rather wetter fields or indicate incorporation of dung into the gully. Consistent fifth to sixth century cal AD dates were obtained on emmer-type wheat and hulled barley from [34] (SUERC-10607; 10608), from which it is reasonable to conclude that both cereals were being used at this time. This is a late date for emmer in general, but might reflect a much longer tradition in using this species in lowland Scotland than otherwise indicated. For example, at East Coldoch, near Stirling, emmer, to date, is the most abundant wheat although very much a minority species compared with the overwhelmingly abundant barley (Huntley forthcoming). Whilst only one emmer grain was recovered, fragments of clear emmer glume bases were also present, so the grain is unlikely to be residual. The adjacent pit F85 was well-sampled, but produced minimal remains.

The three fills of post-pit F182 contained some of the highest concentrations on the site [183, 184, 185]. All three contain hulled barley, oats, and indeterminate cereal grains with clearly better preservation towards the top. Peas survived in the middle layer. Wheat was absent. The low numbers of chaff and weeds may reflect the generally poor preservation on this site. F12,

the other feature that contains moderate numbers of oat grains, is spatially remote from F182, but belongs to the same period of activity. An oat grain and a pea from [184] were dated but gave different results. The oat dated to cal AD 410–570 (SUERC-10619) consistent with other late features, but the pea gave a post-medieval date (SUERC-10620). As the pit lay beneath a later hollow-way though the site, this may explain the intrusion.

The fills [194, 195] of the nearby post-pit F193 produced two samples. The lower fill [195] produced the highest concentration of material on the site, with hulled barley and indeterminable cereal grains in almost equal quantities. Small legumes and probable emmer grain were next most abundant, although no chaff was recorded. This assemblage is thus clearly very different from that of F182, but this does not appear to reflect a significant temporal or functional difference. Probable emmer returned a date of cal AD 330–540 (SUERC-10625) in line with the grain from [34], adding further weight to the conclusion that emmer was being grown at Whittingehame much later than known elsewhere in southern Scotland or northern England. Hulled barley from [195] produced a date consistent with the emmer (SUERC-10621); in all probability they are contemporary.

Most of the remaining features produced little in the way of interpretable plant remains. The fill [18] of post-hole F19 was quite rich in charred cereal and barley grains and contained moderate numbers of *Rumex* (dock) seeds. However, preservation was poor and the material may well have been moved around for some time, or on several occasions, before it became incorporated into this deposit. Both the post-hole and its contents resemble other late features from the site, but a barley grain from the fill yielded a post-medieval date (SUERC-10606).

Charcoal

Abundant charcoal was present in a small number of the environmental samples. The material from four contexts was deemed worth full analysis to investigate the utilisation of wood, probably originating in local woodlands. A number of charcoal samples were recovered by hand during the excavation, but never more than a few pieces from any one context. They are thus unlikely to be representative and were not analysed, but included oak and birch.

For the four contexts analysed, larger charcoal pieces were chosen subjectively as easier to fracture, but none was greater than 1cm and most <5mm. Transverse, radial longitudinal and tangential longitudinal fractures were made by hand. Initially, the transverse face was examined under a Wild stereomicroscope at ×25 and pieces grouped into types. All three faces of a selection of each type were then examined under a Leitz DM/LM epiluminescent microscope at magnifications of up to ×200. Identification was by comparison with Schweingruber (1978) and Hather (2002) and reference material belonging to the author.

Table 8.3
Whittingehame charcoal by taxon

Context	*13*	*55*	*96*	*181*
Betula	39	20	1	38
Corylus	4	21		4
Alnus	1	10		
Salix/Populus	1			
Fraxinus/Quercus	1			
Rosaceae – *Crataegus*-type		1		
Sambucus		4		
Calluna			20	
Pinus-type				1
Rootwood			80+	
Bark				5
Indet. cindery and glassy	9	1	1	9

Table 8.3 presents the counts by taxa. Like the other botanical remains, the charcoal was often crazed and highly friable, but in all cases it was relatively easy to find sufficient fragments to identify. The smaller material was less well-preserved in general. Fragments selected but not identifiable were simply classed as cindery or glassy, which might reflect the temperature of that part of the fire from which they came originally.

Post-hole F130 was the only feature pre-dating the cobbled surfaces to yield a significant amount of charcoal. All the charcoal was <4mm. The assemblage [181] was dominated by birch with a certain amount of hazel and indeterminable material as well as some bark. One fragment of *Pinus* (pine) was recorded. This was characterised by the presence of resin canals but

rather short rays compared with the longer rays typical of *Picea/Larix* (spruce/larch).

The other three assemblages of charcoal belong to the later stages of the occupation. [97] was a burnt patch filling a scoop (F96) cut into the first cobbled surface. It was dominated by very gnarled root wood showing little or no structure in terms of vessels, etc. as expected from root wood. The majority of identifiable fragments were from Ericaceae stems – probably *Calluna* (heather) given their size rather than *Erica* spp. Root pieces reached *c.* 20mm, although most were considerably smaller. [55] came from a charcoal-filled hollow (F54) in the upper cobbled surface, initially thought to be a hearth. Birch and *Corylus* (hazel) were the most frequent taxa and, again, all material was < 10mm. The interesting taxon record in this assemblage was *Sambucus* (elder), with vessels in very obvious clusters and also quite densely packed. One fragment was of Rosaceae *Crataegus*-type (more or less solitary pores, rays 2–3 wide and possible hints of spiral thickening, although the fragment was small and this was not clear). The last sample [13] is from the gully with post-holes (F12) around the pit complex. All of the charcoal was < 10mm and generally in quite good condition. The assemblage was dominated by *Betula* (birch), some extremely slow grown; the occasional fragment of gnarled birch was also recorded. There was one fragment each of *Alnus* (alder) and *Salix/Populus* (willow/poplar).

The taxa recorded are mostly likely to have been available near to the site as evidenced from local pollen diagrams such as Letham Moss and Fannyside Muir (Dumayne-Peaty 1998), both only some few tens of kilometres to the west of Whittingehame. Elder is likely to have been a local shrub too, although its pollen is not recorded in these diagrams. The most commonly occurring taxa and with the most numerous fragments tend to be large shrubs to small trees, with surprisingly little evidence, at one level, for large timber producing taxa such as oak. This might indicate the presence of open, secondary woodland predominantly in the near vicinity of the site, although with only four assemblages this cannot be conclusive. This also, of course, assumes that the charcoal originated in woodland close to the settlement. The elder is interesting, as it is a species that does not burn well and also has a huge folk-lore associated with it – Mrs Grieve devotes no less than 12 pages to elder (Grieve 1998) – such that it is rarely brought into dwellings or burnt for fear of attracting various witches, demons and dryads! On the other hand, its wood has been recorded from a variety of artefacts, especially musical instruments (Gale and Cutler 2000); this is due to its large central pith that is easily removed leaving behind a tube of fine-grained timber.

The contexts are such that they may not reflect wood burnt on domestic hearths but could easily represent clearance of ground prior to building. The latter is certainly possible for [96] with all the root charcoal. There is no evidence for use of off-cuts or waste from structural timbers. The fragments are generally too small to say whether they were from roundwood or large timbers – ring curvature is not obvious in such small pieces.

Whittingehame: summary and discussion

Although only five contexts produced what can be called reasonably rich assemblages of charred cereals, Whittingehame has, nonetheless, made a significant contribution to our understanding of lowland Scottish arable agriculture at the end of the prehistoric period. Hulled barley seems to have been the most common cereal and this is typical of all sites along the eastern coast of northern England and southern Scotland from the Earlier Iron Age onwards. There is no record of naked barley at Whittingehame. This is not surprising given the dates of majority of the excavated contexts as naked barley seems not to have been cultivated much at all into the Iron Age.

Of the relatively small amounts of wheat recorded, only emmer was confirmed from the chaff remains. This may well reflect a genuine absence of spelt and would normally suggest an earlier rather than later first millennium BC date, but there can be little doubt from the radiocarbon dates that emmer was in use here until well into the first millennium AD. The absence of spelt is unusual but perhaps the occupants of Whittingehame remained firmly conservative until the end. On the other hand, the appearance of oats in some abundance in the latest stages of the occupation fits well with evidence from elsewhere. Oats do occur sporadically at central and northern Scottish sites from the Middle Bronze Age, as at Howe (Dickson 1995) and Suisgill (Barclay 1985), and from the Iron Age at Lairg (Holden 1998), but otherwise tend to appear in moderate numbers only from the middle of the first millennium AD. In north-east England, likewise, they mostly appear during later Roman times or later (Huntley and Stallibrass 1995).

Seaweed was apparently used only around the later cobbled surface. Earlier radiocarbon dates were

anticipated on account of marine influence and there is no reason to suppose that it was not contemporary with the barley and hazelnut with which it was associated in [11]. Seaweed might have been used as fodder for livestock, although transporting it from the coast for this reason seems rather unlikely, or it might result from the dung of animals grazed at the coast, or have been purchased, exchanged or raided from a coastal farm. It could also have been used as a manure and perhaps stored at the site to rot or be burnt prior to application on the fields. Manuring is probably the most likely use for this commodity even though the site is some way away from the coast.

Seaweed was highly valued for manuring even in lowland Scotland, although the practice perhaps faded rather earlier here than in northern Scotland and the islands (Fenton 1986). Kerr (1809) suggests that the common practice was to plough cartloads of seaweed into the land immediately upon collection, although composting with any 'long litter" was also favoured at times. Fenton (1986) notes that it was applied at a rate of some 30 double cartloads per acre on many East Lothian farms and that here it was considered as good as an equivalent amount of dung. It was especially applied to barley crops, the barley then favoured for malting, although it would also be used to produce two or even three cuttings of clover. The seaweed could indicate a move towards a more animal-orientated husbandry and/or specialisation of particular farms in the centuries around the mid-first millennium AD, perhaps as a result of social changes at this time. This could also account for the low amounts of wheat, which would have been primarily for human food and, perhaps, largely bought in as grain hence considerably less chance of being burnt and preserved. Unfortunately, the lack of faunal evidence prevents testing this hypothesis.

STANDINGSTONE: THE CHARRED PLANT REMAINS (JPH)

Samples from 122 contexts were assessed, of which 57 were completely analysed. Full details can be found in the archive. As at Whittingehame, the charred remains from Standingstone were often highly friable and sometimes abraded and it is possible that some remains have been lost post-deposition. Cereal grains were again generally of a puffed and worn character, although some of the hulled barley was reasonably well-preserved. This assemblage, too, is sufficiently biased to restrict discussion. The indications are once again that coal was used as a fuel, since coal, clinker

Table 8.4
Standingstone: percentage occurrence of taxa

ecol	*Taxon*	*count of contexts*	*percentage occurrence*
cc	*Hordeum* hulled	21	48.8
ct	*Corylus avellana* nutshell	15	34.9
cc	Cerealia undiff.	16	37.2
cs	*Triticum dicoccon* glume base	10	23.3
cc	*Triticum* sp(p). grain	9	20.9
cs	*Triticum dicoccon* spikelet	7	16.3
cs	*Hordeum* 6-row rachis internode	6	14
cs	*Triticum* glume	5	11.6
cc	*Triticum dicoccon*	5	11.6
cs	*Hordeum* rachis internode	5	11.6
cx	*Bromus* sp(p). grain	4	9.3
ch	*Danthonia decumbens*	3	7
cg	*Plantago lanceolata*	3	7
cc	*Hordeum* indet.	3	7
cg	Poaceae >4mm	3	7
cs	Culm nodes	3	7
cs	*Triticum* brittle rachis internode	3	7
cx	Polygonaceae undiff.	3	7
cs	*Triticum spelta* glume	3	7
ca	*Persicaria lapathifolia*	2	4.7
cc	*Avena* grain	2	4.7
ca	*Fallopia convolvulus*	2	4.7
ch	*Pteridium aquilinum*	2	4.7
cs	*Avena* awn	2	4.7
cr	Chenopodiaceae undiff.	2	4.7
cx	Poaceae <2mm	2	4.7
cw	*Carex* (lenticular)	2	4.7
cr	*Galium aparine*	2	4.7
cm	*Fucus* – thallus/frond	1	2.3
ca	*Chenopodium album*	1	2.3
cc	*Hordeum* naked	1	2.3
cg	Poaceae 2–4mm	1	2.3
cr	*Raphanus raphanistrum* pod frag.	1	2.3
cr	*Rumex obtusifolius*-type	1	2.3
cs	*Hordeum* basal internode	1	2.3
ct	*Malus/Pyrus*	1	2.3
cw	*Carex* (trigonous)	1	2.3

and partially burnt coal remained in many of the flots. Charcoal was moderately common as well, some of it from smaller roundwood, although much was flaky fragments of oak. Whilst this probably indicates some use of wood for fuel, none of the contexts is primary and the charcoal could equally represent tidying up the site. There is no evidence that peat was used as a fuel or bedding/roofing material that was subsequently burnt. One context did contain bubbly and laminated material with no diagnostic features, which might have been burnt dung. Very occasionally samples produced a few fragments of calcined mammal bone but this could just indicate casual disposal of domestic waste in a convenient fire. Otherwise the acidic nature of the sediments precluded good survival of bone.

Forty-three contexts contained charred seeds, although not always more than the occasional one. Only 37 taxa are represented, with most samples containing rather fewer (Figure 8.2). Equally, as the percentage occurrence values show, most taxa are present in relatively few samples (Table 8.4). Not surprisingly for a charred assemblage the most common elements were cereal grains and chaff as well as the almost ubiquitous hazel nutshell fragments. Although widespread, they are not in sufficient concentration in any single context to suggest anything other than casual consumption and disposal.

Excluding one exceptionally rich context [46] containing around 1000 grains, the assemblage comprises 43% cereal grains, 36% cereal chaff, 11% taxa arguably classified as weeds, and 10% taxa not likely to be weeds, such as hazel nutshell. Table 8.5 presents the summary cereal data, again excluding the grain from [46], 84% of which was emmer-type, the rest barley. Elsewhere barley grains predominate. Only 25% of the grains were classed as indeterminate even though preservation was not considered 'good'. This is probably because hulled barley grains are determinable through their angled profile and 'tram-lines' along the ventral groove even when poorly preserved, whilst wheat has the characteristic rounded ventral side. Most of the wheat was *Triticum* sp. with only the occasional grain showing a slight teardrop shape and high dorsal ridge characteristic of emmer. Oat grains are present, but only in very small numbers. Occasional 'large Poaceae' might also have been cereals but could represent wild grasses of a similar size growing amongst the crops.

Looking at the chaff, there were three times the numbers of wheat related items to those of barley. Of the species-identifiable wheat fragments, by far the majority were from emmer, with only seven glume bases attributable to spelt with their strong tertiary venation and obtuse angle (total of 76 identifiable). This strongly suggests that emmer was the main wheat crop. Other remains were from glume wheats, i.e. emmer or spelt, but not identifiable. *Avena*-type awns were the next most abundant cereal chaff with their characteristic twist. However, these are also found in large grasses such as *Helictotrichon*. Culm nodes were rare suggesting that straw was not deposited in these contexts. They are more robust than the glumes so should survive as well if not better if originally present.

Barley chaff confirms the presence of the expected 6-row barley, 2-row generally appearing during the

Table 8.5
Standingstone: cereal grain and chaff fragments in the total assemblage (excluding context 46)

Grain	*No*
Hordeum hulled	69
Hordeum indet.	27
Hordeum naked	6
Triticum dicoccon	7
Triticum sp(p). grain	19
Avena grain	3
Cerealia undiff.	46
CHAFF	
Hordeum 6-row rachis internode	10
Hordeum basal internode	2
Hordeum rachis internode	18
Triticum brittle rachis internode	4
Triticum dicoccon glume base	51
Triticum dicoccon spikelet	18
Triticum glume	16
Triticum spelta glume	7
Avena awn	16
Culm nodes	4

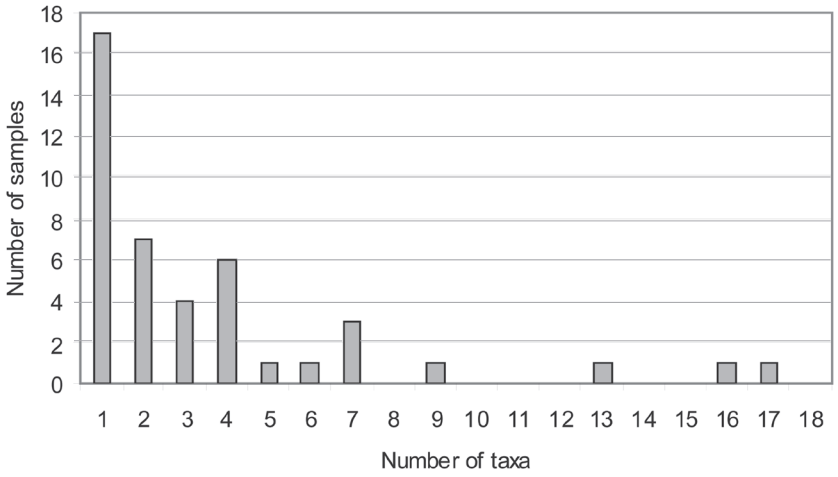

Figure 8.2
Standingstone: Frequency of seed concentrations

medieval period. The grains are not well enough preserved to determine the proportions of twisted to straight embryos in more than the occasional case; many reports classify grains as *Hordeum vulgare* without supporting evidence from the embryos. Other probable food remains are *Malus* (apple) (in one context) and *Corylus avellana* (hazelnut) but numbers are so low that it seems unlikely that these were a major source of food. Both are likely to have been locally picked.

The weed taxa, although not common, are indicative of damp and well-manured land on the whole, with some indications of a wetter habitat. However, some taxa, such as the sedges (*Carex* spp.) may have found their way to the site as fodder, dung, or even bedding, rather than as weeds amongst cereals; that they do grow amongst cereals is clear from modern work in Shetland (Hinton 1990). The *Rumex obtusifolius*-type (docks) could indicate areas of fallow or waste ground, but other evidence for this, for example nettles and thistles, is absent.

Disappointingly, only seven cereal samples were successfully radiocarbon dated (Chapter 9). Interestingly, barley from [46], [298] and [428] (including replacement samples) dissolved during pre-treatment or produced too little graphite, whereas emmer from the first two contexts dated satisfactorily. Clearly the barley grains have charred in a different manner to the emmer – perhaps they had a higher moisture content when burnt.

Archaeological results

Pre-enclosure activity (Table 8.6)

The fill [21] of the early pit F56 contained hulled barley and emmer remains, but also some clear, transversely wrinkled naked barley grains and moderate numbers of fragments of apple pips. Septae from the apple 'core' were also common, but not counted. Grains of naked and hulled barley each yielded a late Neolithic radiocarbon date (SUERC-10535; 10536), consistent with the cord-impressed pottery.

Neither of the Bronze Age cremations produced any seeds. Three of the nearby pits were sampled, but apart from one wheat grain and one fragment of 6-row barley rachis from [244 in F243], these too were barren. The irregular gully or burrow (F270) cutting Cremation 2 contained a fragment of cereal grain.

The other pre-enclosure features yielded very little material and many samples were barren, including those from the linear ditch F31. The main exceptions are provided by three of the pits with burnt material identified on site. The fill [42] of pit F41 yielded one of the richer samples from the whole site in terms of range of taxa. Emmer glume bases and spikelet forks were the most common cereal, but hulled barley grains are also represented; weed seeds suggest nutrient-enriched soils and, possibly, burnt turf or grassland material. Only charcoal was found in the base of the possible oven F227, but its upper fill [228] yielded a few hulled

Table 8.6
Standingstone: early features (seeds/100 litres)

	Context	21	42	51	127	146	197	203	209	213	228	231	244	271	293	314	347
	Feature	F56	F41	F50	F125	F145	F196	F212	F208	F212	F227	F230	F243	F270	F292	F313	F346
ecol	*Volume floated (litres)*	7	7	2	2	5	2	2	10	4	4	5	10	2	4	8	3
cc	Cerealia undiff.	143	14				50	100		25		20		50			
cc	*Hordeum* hulled	271	29		50	20					50						33
cc	*Hordeum* indet.	343		50													
cc	*Hordeum* naked	86															
cc	*Triticum dicoccon*														50		
cc	*Triticum* sp(p). grain	50	17										17				
cs	*Hordeum* 6-row rachis internode												10				
cs	*Triticum dicoccon* glume base		100	50				50	10								
cs	*Triticum dicoccon* spikelet		14														
cs	*Triticum glume*			50													
cs	Culm nodes											20					
ca	*Chenopodium album*		43														
ca	*Persicaria lapathifolia*								10								
cg	*Plantago lanceolata*		14	50													
ch	*Danthonia decumbenss*		43														
cm	*Fucus* – thallus/frond							50									
cr	Chenopodiaceae undiff.								10								
cr	*Galium aparine*										25					13	
cr	*Raphanus raphanistrum* pod											20					
ct	*Corylus avellana* nutshell		43					150									
ct	*Malus/Pyrus*	86															
cx	Polygonaceae undiff.								10								

barley grains. The third pit (F230) contained a radish pod fragment, a part of a cereal grain and one piece of straw in its fill [231].

The upper fill [203] of pit F212 to the south-west of the enclosure yielded a piece of charred brown seaweed – the only record from this site – as well as hazel nutshell, and its basal fill [213] had a cereal grain fragment. The fill [209] of post-hole F208, cutting the pit, produced a few weeds, an emmer glume base and moderate numbers of small fragments of what might have been burnt dung. Some of this honeycomb material clearly contained weed seed fragments too, possibly suggesting herbivore dung. Otherwise, the only finds were from odd post-holes around the site. F292 produced two emmer-type grains [293]; F346 [347] and F145 [146] yielded one hulled barley grain each; and F50 had indications of grassland taxa [51].

The Late Bronze Age enclosure and palisade (Table 8.7)

Most of the 15 ditch samples were unfortunately barren; the only finds were hazelnut shell fragments from [283], a hollow or possible post-setting where the north terminal peters out in the bedrock, and [253], one of the upper fills in the eastern section.

A number of samples were taken from along the palisade trench, but most were barren and none of those with material [10, 12, 104, 269] contained more than a fragment or two of barley, wheat or hazel nutshell). Radiocarbon dates were obtained from a wheat grain from [12] (SUERC-10530), and a hulled barley grain [8] from post-hole F7 that cuts the palisade and is probably related to it (SUERC-10528).

Easily the most productive feature from this phase, and indeed from the whole TLEP, was a small pit F45 close to the palisade and probably sealed beneath the bank. The 1.5 litres processed from its fill [46] was

Table 8.7
Standingstone: enclosure features (seeds/100 litres)

		Palisade					*Ditch*		*Other*				
	Context	10	104	269	12	8	253	283	46	60	160	217	428
	Feature	F13	F13	F13	F11	F7	F273	F282	F45	F61	F159	F216	F427
ecol	*Volume floated (litres)*	6	12	8	2	6	14	8	2	15	5	13	9
cc	Cerealia undiff.												11
cc	*Hordeum* hulled	67			50	33			*7000*				
cc	*Hordeum* indet.											15	
cc	*Triticum dicoccon*								*43000*				
cc	*Triticum* sp(p). grain				33	33							
cs	Culm nodes		17										
ch	*Danthonia decumbenss*									20			
cr	Chenopodiaceae undiff.								100				
ct	*Corylus avellana* nutshell		17	13			7	63		7	20		
cw	*Carex* (trigonous)									7			
cx	*Bromus* sp(p). grain	17											
cx	Poaceae < 2mm											15	
cx	Polygonaceae undiff.								50				

Table 8.8
Standingstone: circular structures (seeds/100 litres)

		CS1					*CS2*									*CS3*	
	Context	82	94	110	461	329	130	140	109	112	344	345	352	462	469	298	302
	Feature	F79	F106	F106	F106	F328	F451	F139	F359	F359	F359	F359	F359	F359	F468	F297	F301
ecol	*Volume floated (litres)*	6	11	11	12	8	14	16	10	9	11	11	6	13	7	16	12
cc	*Avena* grain															13	8
cc	Cerealia undiff.		9	27		13					27	36	17		71		83
cc	*Hordeum* hulled	17	18		17		21	6			9	55			157	31	25
cc	*Hordeum* indet.		9														
cc	*Triticum dicoccon*						7								14	19	
cc	*Triticum* sp(p). grain			17							50				33		67
cs	*Avena* awn															81	25
cs	*Hordeum* 6-row rachis internode			9							9				43	19	8
cs	*Hordeum* basal internode															13	
cs	*Hordeum* rachis internode						21				9				43	38	42
cs	*Triticum* brittle rachis internode			9												13	8
cs	*Triticum dicoccon* glume base			82		13					9				71	106	67
cs	*Triticum dicoccon* spikelet		9	9		38	14									31	42
cs	*Triticum spelta* glume						7								29		33
cs	*Triticum* glume			27							9				14		83
cs	Culm nodes														14		
ca	*Fallopia convolvulus*											9					8
ca	*Persicaria lapathifolia*														14		
cg	Poaceae >4mm		9							11							8
cg	Poaceae 2-4mm															13	
cg	*Plantago lanceolata*																25
ch	*Pteridium aquilinum*						7										8
ch	*Danthonia decumbens*				8												
cr	*Rumex obtusifolius*-type															6	
ct	*Corylus avellana* nutshell	17			17		29		10			9		8		13	8
cw	*Carex* (lenticular)				17										14		
cx	*Bromus* sp(p). grain	17													14	6	
cx	Poaceae <2mm															25	
cx	Polygonaceae undiff.															13	

almost pure grain, the whole sample comprising some thousand or more grains. Of 400 grains counted, about 84% was emmer-type with the high dorsal ridge and slight tear-drop shape, the remaining 16% hulled barley. Preservation was not good and it was not possible to determine attitude of the embryos on the barley grains to a sufficient extent to determine whether this was *Hordeum vulgare* or *H. distichon*, although chaff in other contexts strongly suggests the former. Only three weed seeds were recovered, suggesting that the content was fully processed grain. An emmer grain produced a date of 1030–830 cal BC (SUERC-10537), although the barley grains failed to date.

Four of the possible rectilinear post-hole structure near the palisade yielded material: [60, F59] and [160, F159] both have charred hazel nutshell; [217, F216] barley and [428, F427] unidentifiable cereal.

The Iron Age circular structures (Table 8.8)

All but one of seven contexts sampled from the CS1 sunken-floored feature F79 were barren, apart from surface fill [82], which produced hulled barley, hazel nutshell and a brome grass seed. In contrast, the four samples from the outer gully F106 were all productive: [110] contained emmer and 6-row barley chaff as well as some indeterminate glume wheat chaff and a few cereal grains; [94] produced hulled barley grain and emmer glumes; [461] hulled barley and hazel nutshell; whilst post-setting F328 [329] at the end of the gully contained two emmer glume bases and spikelets.

The outer gully of CS2 (F359) was again productive, with six of the eight samples – from both phases – yielding some material. Two samples from the southern terminal [344; 345], each produced moderate numbers (for this site) of hulled barley and emmer-type wheat grain and chaff. Those from elsewhere on the circuit had less material, with [462] producing a little barley rachis and hazel nutshell, [352] a single mineral concreted cereal grain, [109] hazel nutshell and [112] a large grass or possibly cereal. In addition, a relatively rich sample came from an indistinct feature [F468, 469], which may well be a continuation of the gully but had frustratingly been disturbed by an animal burrow! As well as hulled barley, emmer and spelt glumes, and some weeds, it contains material akin to burnt daub.

The fill [130] of the deep end of the sunken-floored feature (F451) was also quite rich: not only emmer and hulled barley were present, but also a possible spelt glume, although not well enough preserved to be sure. Unfortunately none of the other fills of this feature was sampled. The fill [140] of one of two intercutting post-pits (F139), which might be associated with CS2, produced only a scrap of rush stem and a modern grain (SUERC-10549).

The northern and southern parts of the third sunken-floored feature F297 yielded markedly different samples. A sample from the northern part was barren, whilst two samples from the bulbous southern end were both relatively rich. Emmer glumes were common in [298], as were the ubiquitous hulled barley grains; 6-row barley chaff confirmed the presence of this species. Oat grains and oat-type awns were also present, although the awns were the twisted ones characteristic of some large meadow grasses as well as of oats. Weeds are recorded as well as taxa more common in grassland. There might, as a result, be a turf component present. The sample from [302] was extremely similar in taxa composition, but included a few fragments of bracken frond and some spelt glume bases.

Discussion

Many of the samples produced rather sparse plant remains, limiting interpretation. Clearly 6-row hulled barley and emmer wheat were the main crops being used. Spelt evidence is low and might just reflect weeds amongst other crops, although the three contexts with spelt all have Later Iron Age associations, emmer seeds from two of them yielding radiocarbon dates in that period (SUERC-10547, 10558). Occasional oats are present but lack the diagnostic floret bases, so it is impossible to be sure whether they are cultivated or wild. The low numbers might well suggest wild. The presence of grains and chaff of the major species indicates that they were being processed to a certain degree locally and it can be assumed that they were also grown locally. The nature of the preservation might have lost some of the more delicate remains so there may be a bias towards the more robust material, the grains.

Hazel nutshell fragments are scattered throughout many contexts. They are always in low numbers and no doubt represent casual disposal of locally collected fruit. Of more interest, apple remains – pips and septae – were moderately abundant in the later Neolithic pit F55, which also contained naked barley grains. Few settlements have had naked barley dated. At Lairg, where several sites of Bronze Age date were excavated, naked six-rowed barley is the only cultivar present, apart from occasional grains resembling hulled barley (Holden 1998). Likewise

Table 8.9
Knowes: charred plant remains from the western enclosure ditch (seeds/100 litres)

		F12 (2002)					*F103*										*F267*	*F269*
	Context	7	8	9	10	11	105	132	136	137	143	146	156	162	179	189	268	270
ecol	*Volume floated (litres)*	5	5	5	5	5	5	18	5	26	21	10	5	7	20	3	4	5
cc	*Avena* sp. grain (Oats)																	20
cc	Cerealia indet. grain	180		100	140	60	20	67		77	19	100		214			29	20
cc	*Hordeum* sp. grain (Hulled barley)	40	120	440	260	220		44		69	10	220		200	20			
cc	*Hordeum* sp. grain (Barley)							17		189	24	30	40	114	15	67		
cc	*Triticum* sp. grain (Wheat)		40	40	100		20	11	20	35	14	40	20	29		33		
cc	cf. *Triticum dicoccum*				20	40												
cs	*Hordeum* sp. rachis internode (Barley)	60	20		180	80				15		10						
cs	*Hordeum* sp. basal rachis node	20		20	20													
cs	*Hordeum* sp. rachis internode (6-row)			400	100					8				29				
cs	*Triticum* brittle rachis internode				40													
cs	*Triticum* sp. glume base			140	120													
cs	*Triticum dicoccum* glume base (Emmer)	20		180	420			6		4		20		43	5			
cs	*Triticum dicoccum* spikelet fork (Emmer)				20	40		6				10						
cs	*Triticum spelta/dicoccum* spikelet base									12		20		43				
cs	*Triticum spelta* glume base (Spelt)				80	80				8				14				
cs	monocot culm node			20														
ca	*Chenopodium album*			140	40	60												
ca	*Persicaria lapathifolia*	120		140	20	80												
ch	*Danthonia decumbens* (Heath-grass)	40	140	520	760	760				65		10		171	5			
ch	Empetrum nigrum fruit			20														
cr	Cirsium sp. (thistle)				20													
cr	*Plantago lanceolata* (Ribwort plantain)			20						4		10		14				
cr	Polygonaceae (Knotgrass)			20		40						10		14				
ct	*Corylus avellana* (Nutshell)							11		12								
cw	*Carex* sp. trigonous nutlet (Sedge)	100	40	380	220	200				39		20		29				
cw	*Carex* sp. lenticular			200	300													
cw	Montia fontana ssp. chondrosperma				20													
cx	*Mentha* sp. (Mint)											10						
cx	Poaceae (Grass)	40		340	380	120				19		30		71				
cx	Ranunculus repens-type				20													
cx	*Rumex* sp. (Dock)	20		20	40			6		27	5	10		14				
cx	Potentilla erecta-type				20													
cx	*Veronica hederifolia* (Ivy-leaved speedwell)	20		40														
cx	*Vicia* sp. (Vetch)							6										

at Suisgill, naked barley was dominant during the Bronze Age, although wheat and oats were recovered in low numbers (Barclay 1985). Both sites, however, are considerably further north. At Howe, naked barley dominated throughout the Iron Age (Dickson 1995), but in southern Scotland, it seems to have been replaced by hulled barley at some stage during the first millennium BC (Huntley 2000).

The few weed seeds that were found, indicate well-manured slightly heavier soils. Sedges, grasses, and bracken remains might all indicate burning of turves, either from roofing or fuel (Hall 2003). Only a single fragment of seaweed is present, in contrast to its relative abundance at Whittingehame. It might have been used as manure or arrived at Standingstone as 'packing' for shellfish in order to keep them alive and fresh on their journey from the coast. Presumably it was burnt by accident.

It is unusual for ditch terminals to be barren, since these are often places where botanical material is dumped or falls in. It may be that the occupants of the Late Bronze Age enclosure, although growing some cereals, were not producing a large excess and hence generated little crop processing debris. The Iron Age curvilinear structures are clearly the richest in terms of both concentrations and numbers of taxa recorded and it may be that crop processing activities were being undertaken in or near them.

KNOWES: THE CHARRED AND WATERLOGGED PLANT REMAINS (CO'B)

Samples were collected from 121 contexts, of which 47 were processed in their entirety. Anaerobic conditions in one of the ditch terminals permitted the preservation of waterlogged plant remains, but otherwise the free-draining nature of the site resulted in preservation being restricted to charred macrofossils. 62 contexts contained charred plant remains, of which all but two included cereals. However, cereal remains were mostly

Table 8.10
Knowes: charred plant remains from the entrance area (seeds/100 litres)

		North terminal				*Gully*	*S terminal*		*Cist*	
	Context	219	250	271	272	178	127	285	149	163
	Feature	F151	F151	F151	F151	F177	F221	F221	F226	F226
ecol	*Volume floated (litres)*	5	5	41	11	5	10	5	41	35
cc	Cerealia indet. grain					20				
cc	*Hordeum* sp. grain (Hulled barley)				9		10	20		
cc	*Hordeum* sp. grain (Barley)			2					2	6
cs	*Hordeum* sp. rachis internode (Barley)				9					
cs	*Hordeum* sp. rachis internode (6-row Barley)				27					
cc	*Triticum* sp. grain (Wheat)	20	20							
cs	*Triticum dicoccum* glume base (Emmer)				9					
cs	*Triticum spelta/dicoccum* spikelet base (Spelt/emmer)				9					
cs	*Triticum spelta* glume base (Spelt wheat)		40		46					
cg	*Arrhenatherum elatius* ssp. *bulbosum* (Onion couch)									3
ch	*Calluna vulgaris* twig (Heather)				9					
ct	*Corylus avellana* (Nutshell)								2	
cx	Poaceae (Grass)	20								

present in very low numbers, although a few samples yielded high concentrations (>500 remains/100 litres), notably from the western enclosure ditch, the CS2 oven and drain F140. Grains of barley and wheat occurred regularly, along with the chaff of 6-row barley, emmer and spelt and occasional oats The samples produced small flots ranging from 1–225ml. A large number of residues contained shattered stones, but as these did not appear fire-blackened, they were presumably cracked by natural causes. A fair number of residues contained small fragments of burnt and unburnt bone, as well as occasional tooth fragments. Several cereal samples were radiocarbon dated, helping to confirm that the occupation lies in the Later Iron Age and Roman period.

Archaeological results

The enclosure circuit

The basal fill of the primary cut of the western enclosure ditch was barren, but several of the fills of the recuts contained abundant charred cereals, the highest concentrations coming from [162] and from [9, 10, 11] in the 2002 evaluation. These samples were dominated by grains of hulled barley and indeterminate cereals, with lower numbers of wheat grains (Table 8.9). Barley rachis internodes were present in eight contexts and the better-preserved fragments were identified as 6-row barley. Emmer chaff was present in nine contexts; four of which also contained spelt chaff. The relatively large number of fills with charred cereals and charcoal suggests that the re-cut enclosure ditch on this side was used to dispose of domestic waste. This is corroborated by the presence of animal bone fragments and mussel shells in many of them. An oat grain was found in one of the post-holes beside the ditch (F269).

Only low numbers of charred cereals were preserved in the entrance terminals (Table 8.10). These included a few grains of wheat and hulled barley. Chaff of 6-row barley, emmer and spelt occurred, with spelt being the most abundant. By contrast, a diverse range of uncharred seeds was present in the waterlogged basal deposits [271] and, to a lesser extent, [272] of the northern terminal (Table 8.11). These are scored on a 1 to 5 scale (1 representing the lowest values, the highest). Nettles were abundant, and pale persicaria, sedges, and marsh pennywort were growing in and around the water. Ruderal taxa such as prickly sow-thistle, knotgrass and thistle will have occupied nearby areas of waste and disturbed ground. Buttercups, violets, pinks, cinquefoils, fat-hen and mosses were also common.

Table 8.11
Knowes: waterlogged plant remains from northern ditch terminal (relative abundance)

	Context	271	272
ecol	*Volume assessed (ml)*	200	30
wa	*Chenopodium album* (Fat-hen)	2	1
wr	*Cirsium* sp. (Thistle)	1	
wr	*Polygonum aviculare* (Knotgrass)	1	
wr	*Sonchus asper* (Prickly sow-thistle)	1	
wr	*Urtica dioica* (Common nettle)	5	1
ww	*Carex* sp. biconvex nutlet (Sedge)	1	
ww	*Carex* sp. trigonous nutlet (Sedge)	2	1
ww	*Hydrocotyle vulgaris* (Marsh pennywort)		1
ww	*Montia fontana* (Blinks)		1
ww	*Persicaria lapathifolia* (Pale persicaria)	3	
wx	Caryophyllaceae sp. (Pink family)	1	
wx	*Musci* spp. (Mosses)	2	
wx	*Potentilla* sp. (Cinquefoil)	3	1
wx	*Rumex acetosella* (Sheep's sorrel)		1
wx	*Ranunculus Ranunculus* (Buttercup)	2	1
wx	*Viola* sp. (Violet)	1	

Many of the cist fills contained charcoal, which might be from the funeral pyre, but very few other plant remains were found: a charred tuber of onion couch, a hazelnut shell fragment and two barley grains. The barley and hazelnut might represent the remains of food offerings placed on the pyre. Onion couch tubers, from ungrazed grassland, have often been found in Bronze Age cremations (Robinson 1988) and in this context, this grass may have been used as kindling. It is also suggested that they were collected for food (Godwin 1975). A barley seed and birch twig from [163] yielded overlapping, but statistically inconsistent, radiocarbon dates pointing to the early centuries AD (SUERC-10577; SUERC-10578).

Table 8.12
Knowes: charred plant remains from the interior (seeds/100 litres)

	Feature	*F342*	*F232*	*F234*	*F232 F292*	*F274*	*F301*	*F323*	*scoop F404*			*drain F140*	*pit F251*
	Context	138	139	147	293	296	310	367	330	331	368	142	265
ecol	*Volume floated (litres)*	22	5	42	5	29	5	5	5	5	5	15	5
cc	Cerealia indet. grain	46				4			20		80	73	
cc	*Hordeum* sp. grain (Hulled barley)	50				4			100	60		127	
cc	*Hordeum* sp. grain (Barley)	77	20	7				20				387	20
cc	*Triticum* sp. grain (Wheat)				20		20				60	53	
cs	*Hordeum* sp. rachis internode (Barley)	5										13	
cs	*Hordeum* sp. rachis internode (6-row barley)									40			
cs	*Triticum dicoccum* spikelet fork (Emmer)									20			
cs	*Triticum dicoccum* glume base (Emmer)											13	
cs	*Triticum spelta/dicoccum* spikelet base											20	
cs	*Triticum spelta* glume base (Spelt wheat)	9										7	
ch	*Danthonia decumbens* (Heath-grass)	9										40	
cr	*Persicaria maculosa* (Redshank)											13	
cr	*Plantago lanceolata* (Ribwort plantain)											13	
ct	*Corylus avellana* (Nutshell)											7	
cw	*Carex* sp. trigonous nutlet (Sedge)											67	
cx	Poaceae (Grass)	36							20			53	
cx	*Rumex acetosella* (sheep's sorrel)	18											
cx	*Rumex* sp. (Dock)	14										40	

Table 8.13
Knowes: charred plant remains from the circular structures (seeds/100 litres)

		CS1 area				*CS2 area*														
	Context	161	259	316	229	364	365	366	371	361	373	375	261	281	124	197	362	134	135	185
	Feature	F160	F160	F314	F284	F378	F378	F378	F370	F360	F372	F374	oven	oven	F128	F128	F128	F129	F129	F129
ecol	*Volume floated (litres)*	28	5	3	5	12	5	6	5	5	5	5	10	5	9	18	5	5	9	5
cc	*Avena* sp. grain (Oats)							17												
cc	Cerealia indet. grain	4	20		40	25	20	50	20	40	132	20	50	80	56	39		20	44	
cc	*Hordeum* sp. grain (Hulled barley)	4			20	42		50		60	434	20	610	360		139		40		
cc	*Hordeum* sp. grain (Barley)		20			8							40		100	22			11	
cc	*Triticum* sp. grain (Wheat)	4						17			38		50	20	33	28	20			20
cs	*Triticum dicoccum* spikelet fork (Emmer)												10							
cs	*Triticum spelta/dicoccum* spikelet base (Spelt/emmer)										19		50	40						
ca	*Raphanus raphanistrum* (Wild radish)				20															
cg	*Arrhenatherum elatius* ssp. *bulbosum* (Onion couch)					8														
cr	*Plantago lanceolata* (Ribwort plantain)										19		10	20	11					
ct	*Corylus avellana* (Nutshell)			33											11			20		
cw	*Carex* sp. trigonous nutlet (Sedge)										19									
cx	Poaceae (Grass)												10							
cx	*Rumex* sp. (Dock)								20										11	

The interior

Contexts associated with the deeper scoops generally yielded low numbers of charred plant remains (Table 8.12), implying that the area was kept relatively tidy. A few barley, wheat and indeterminate cereal grains were present in contexts associated with the western end of the scoop (F232), whilst chaff of 6-row barley, an emmer spikelet fork and more barley grains were in deposits used as levelling in scoop F404 at the eastern end. More grain, and barley and spelt chaff, as well grass seeds were recovered from material accumulating in scoop F342 north of the scoop entrance. The only context with a significant density of charred remains was the fill of the drain (F140) leading away from the scoop towards the enclosure ditch. Barley grains, chaff of both barley and wheat, and a variety of weed seeds were all present, suggesting that waste may have been dumped there after the drain passed out of use

Although a range of contexts was sampled in the area of CS1, few yielded charred remains, comprising some barley, a hazel nutshell fragment and a pod of wild radish (Table 8.13). However, several contexts associated with scoop F238 and CS2 did contain moderate numbers of charred remains, with high concentrations in the oven [261, 281]. These were again dominated by hulled barley grains with lesser numbers of indeterminate cereals and some wheat present. An emmer spikelet fork was recorded in [261] and spikelet bases of emmer or spelt were present in three contexts. Another onion couch tuber occurred the hollow F378 underlying CS2. Charred weed seeds included ribwort plantain, sedge, grasses and docks. The large number

Table 8.14
Knowes: charred plant remains from the external pit complex (seeds/100 litres)

	Feature	*F5*				
	Context	4	6	7	8	27
ecol	*Volume floated (litres)*	28	16	14	5	5
cc	Cerealia indeterminate grain	4	6	50	40	
cc	*Hordeum* sp. grain (Hulled barley)	21	38	50		
cc	*Hordeum* sp. grain (Barley)	4	31	200	20	
cc	*Triticum* sp. grain (Wheat)	4	25	50		
cs	*Hordeum* sp. rachis internode (Barley)			7		
cs	*Hordeum* sp. rachis internode (6-row Barley)			21		
cs	*Triticum dicoccum* glume base (Emmer)			21		
cs	*Triticum dicoccum* spikelet fork (Emmer)		6	7		
cs	*Triticum spelta* glume base (Spelt wheat)		6	50		
ch	*Danthonia decumbens* (Heath-grass)			50		
cr	*Plantago lanceolata* (Ribwort plantain)		6			20
cw	*Carex* sp. biconvex nutlet (Sedge)			7		
cw	*Carex* sp. trigonous nutlet (Sedge)			71		
cw	*Persicaria lapathifolium* (Pale persicaria)			7		
cx	Poaceae (Grass)			29		
cx	*Rumex* sp. (Dock)			21		

Table 8.15
Knowes: charcoal by context

Context	*Feature*	*Taxon*
102	F103	Alder
104	CS2	Alder; Oak
138	F340	Oak
124	CS2	Alder × 2; Oak
197	CS2	Alder; Oak
222	Cist	Oak
213	F212	Oak × 3
261	CS2 oven	Alder
344	CS2	Oak

of cereal remains associated with the oven suggests that at least one of its functions was as a grain-drier. Scoop F129 adjacent to CS2 yielded a few more cereal grains and another hazelnut fragment.

The external pit complex

The 12 samples from the pit complex outside the enclosure were dominated by coal and charcoal; only five samples yielded charred plant remains, all of them fills of scoop F5. Its upper fills, especially, contained moderate quantities of barley grains, with low numbers of 6-row and undifferentiated barley chaff, but also wheat grains and both emmer and spelt chaff (Table 8.14). Charred weed seeds were frequent in [7], including heath-grass, sedges, pale persicaria, grasses and docks, whilst ribwort plantain occurred in [6] and [27]. The results suggest that domestic waste, including fuel waste, was deposited in the scoop.

Charcoal

A number of charcoal samples recovered by hand were scanned at up to ×500 magnification to analyse the macroscopic and microscopic characteristics. Charcoal from 26 contexts was examined, of which 15 fragments were identified to species, all either alder or oak (Table 8.15). No signs of working were evident on any of the pieces, nor was any bark present. Over half the pieces came from CS2, perhaps reflecting their use as building material or firewood. Only alder was present in the oven, whilst a lump of oak charcoal from the cist implies that oak was among the wood used on the pyre.

Discussion

Cereal remains were only abundant in the fills of the western enclosure ditch, in the CS2 oven and in the drain (F140). These assemblages were very similar to one another. Barley and wheat chaff also occurred, but always in relatively low numbers compared to grain. In all cases, barley was the most frequently recorded taxon, and a large proportion of the grains were hulled. No naked barley was identified, but abrasion of the surface of the grains led to approximately 50% of them being recorded as undifferentiated. At least some, if not all, of the barley was from the 6-rowed variety

None of the wheat grains was securely identified to species, but spikelet forks and glume bases of emmer and spelt indicate that both taxa were in use. Although the numbers of emmer and spelt chaff fragments were low, they occurred in roughly similar proportions, neither appearing dominant. Emmer chaff was present in 11 contexts, while spelt occurred in eight and they occurred together in five. The chaff was often damaged and several glume bases could not be differentiated between emmer or spelt. Both species seem to have formed a component of the wheat used throughout the occupation. Single oat grains occurred in a post-hole by the western ditch and in the hollow F378 beneath CS2. Without chaff, it was not possible to identify if they were from a wild or cultivated species, but the low number implies that they were not grown as a crop.

In order to investigate whether crop processing was undertaken at Knowes, the ratios of chaff and weed seeds to grains were calculated. According to Hillman (1981), a ratio of 1 for the glume wheats would indicate the presence of complete ears, while a greater ratio would suggest fine sieving residue. For 6-row barley, a ratio significantly greater than 0.3 suggests winnowing or coarse sieving debris. In the same way, a higher proportion of weed seeds than grain would indicate crop-processing waste. The ratios were calculated for the 10 contexts with more than 50 items. The figures for emmer and spelt were combined and the barley was assumed to be all of the 6-row variety. All charred weed seeds were included, except those in the heathland and tree/shrub categories.

For the wheats, four contexts from the western enclosure ditch [9–11, 162], produced high ratios

(between 3.0–8.0). This suggests that some crop processing took place and that by-products were discarded in the ditch. The other wheat ratios ranged from 0.7 to 1.6 with an average of 1.1, suggesting that the crop was already to a large extent processed. The wheat seems to have been dried and stored as spikelets, as the ratio of the wheat associated with the oven was 1.2. For barley, three contexts from the western ditch [9– 11] had ratios above 0.3 (between 0.36–1.15); the remainder had lower values (between 0.03–0.11), suggesting that this barley was fully processed. The same three ditch samples had high ratios of weed seeds to grain (3.8–4.8) and so almost certainly include fine sieving debris, whereas the average for the rest was only 0.5, implying that fine sieving more often took place away from the site.

Hazelnuts were gathered as an additional food source and local hazel woodlands may have been coppiced to increase the productivity, but the low number of nutshells suggests they were not a dominant part of the diet. An onion couch tuber found in the cist burial might have been used as kindling for a funeral pyre. It also occurred in association with the oven in CS2, which may indicate that the tubers were also used as a food source.

A range of other seeds preserved through charring or waterlogging give a picture of the ecological habitats present at or near the site. *Danthonia decumbens* may have grown as an arable weed, or may indicate the presence of damp sandy or peaty acidic heathland (Stace 1997). Sheep's sorrel would also have grown on acid heath. Onion couch would have grown in ungrazed grassland areas that needed to be maintained by cutting to prevent its succession to scrub and woodland (Rodwell 1992). By contrast the occurrence of ribwort plantain, which is often associated with pasture (Behre 1986), suggests that domestic animals were grazing locally. Sedges and pale persicaria suggest areas of damp ground. These taxa may have been collected for bedding or thatching, or the sedge rhizomes may have been used for food. Ruderal taxa included docks, knotgrass and redshank, which would have grown on areas of disturbed, waste ground.

In summary, the botanical remains from Knowes imply the use of barley, emmer and spelt wheat throughout the occupation of the site. The greatest numbers of charred remains relate to the disposal of domestic waste and accidental charring of cereals in the CS2 oven. The proportion of chaff and of arable weeds to grains is generally low, suggesting that crop processing at the site was not the norm. Charred seeds suggest areas of damp ground and heathland nearby, in addition to grazed and ungrazed grassland.

EAST BEARFORD: THE WATERLOGGED PLANT REMAINS (JPH)

Bulk samples were taken from five contexts. Initial assessment established that four of them had little potential for charred plant remains, with only one indeterminate cereal grain fragment and one emmer glume [2] present, but a sample from the basal fill of the enclosure ditch [23] was obviously waterlogged and therefore analysed. Two litres of material was floated to 500 μm and the flot then kept wet.

The wet flot consisted almost entirely of a very fine amorphous organic material with some *Calluna* wood, shoots and flowers, occasional other woody fragments, bracken frond fragments and occasional large grass stems. A few *Daphne* ephyppia were present, as were moderate numbers of fragments of insects and the occasional fly puparium. For the volume of material sorted, seeds were surprisingly uncommon (Table 8.16).

Although the fine organic amorphous material might reflect plants growing around the ditch, the

Table 8.16
East Bearford: waterlogged seeds

Context	*23*
Volume processed (litres)	2
Persicaria lapathifolia	1
Urtica urens	3
Cirsium sp.	1
Potentilla erecta-type	1
Carex (lenticular)	1
Torilis sp.	2
Poaceae >4mm	2
Galium palustre	1
Stellaria alsine	1
Urtica dioica	1
Ranunculus repens	1

heather and bracken fragments seem more likely to represent material dumped there, although these heathland/moorland plants might have been growing locally if occupation was not particularly intense in the area. The *Daphnia* ephyppia indicate the presence of water. Some of the seeds are from damp-wet loving plants but generally on edges of fens or especially wet fields, for example the *Stellaria alsine, Galium palustre* and possibly the *Carex*. Otherwise the plants are rather broad in their preferred habitats although several grow best in nitrogen enriched soils, especially the *Urtica* species. *Urtica urens* and the *Polygonum* are also typical weeds and there must have been open ground nearby.

An attempt to radiocarbon date the emmer glume from [2] failed, but one on an alder twig from [23] suggests a Later Iron Age date for the ditch (SUERC-10626).

FOSTER LAW: THE CHARRED PLANT REMAINS (JPH)

Assessment of samples from 19 contexts in the Foster Law ditches suggested that three [4, 15, 53] were worth further effort, but in the event only [15] was processed in full.

The assessment of the stony spread over the top of the ditches [4] produced four barley grains (Table 8.17). Like the rest of the flot material, these were extremely silty, making any characteristic cell patterns extremely difficult to see. Brief treatment in an ultra sonic bath removed a little silt, but the underlying charcoal was so fragile that it, too, broke up, so no further work was undertaken on this context.

The upper fill [15] of the recut inner ditch yielded several hulled barley grains, a spelt glume base and a few weed seeds, along with quite a few fragments of twigs or small roundwood, cindery charcoal and occasional metallic honeycomb debris. Much of the charcoal was heavily abraded. Another spelt glume was recorded from the primary fill [53] of the inner ditch. Radiocarbon dates suggest that this was dug in the Earlier Iron Age (Chapter 9), but that the recut belongs to the Later Iron Age (SUERC-10635). A hulled barley grain from the basal fill [13] of the outer ditch proved to be modern (SUERC-10630) and must have fallen into the ditch.

The limited plant remains indicate that both hulled barley and spelt wheat were being used at Foster Law, possibly grown in the case of the wheat given that only chaff survives. The few weeds indicate reasonably well-manured soil with hints of waste ground.

Table 8.17
Foster Law: charred plant remains (seeds/100 litres)

	Context	*4*	*15*	*17*	*25*	*27*	*43*	*53*
ecol	*Volume floated (litres)*	5	25	5	5	5	5	5
cc	Cerealia indet.				20		20	40
cc	*Hordeum* (hulled) grain	60	28					
cc	*Hordeum* indet	20						
cs	*Triticum* glume base							20
cs	*Triticum spelta* glume base		4					20
cr	*Plantago lanceolata*					20		
cr	*Rumex obtusifolius*-type		8					
ct	*Corylus avellana* nutshell			20				20
cw	*Persicaria lapathifolia*		4					
cx	Poaceae 2-4mm		4					

EAST LINTON: THE CHARRED PLANT REMAINS (CO'B)

The 19 samples taken from the three ditches and palisade at East Linton produced very low volumes of flot, in which charred plant macrofossils were virtually absent. A single charred wheat seed from the basal fill [21] of the inner ditch was dated to the Late Bronze Age (SUERC-10627), as was birch charcoal from the palisade [24] (SUERC-10628). Pieces of birch charcoal were also identified in [21] and in the recut [30] of the middle ditch, but this yielded an Iron Age date (SUERC-10629).

ANIMAL BONE

LOUISA GIDNEY

None of the TLEP sites yielded animal bones in any quantity, the generally acidic soils of the region clearly being anything but conducive to the preservation of faunal remains. Minimal amounts of fragmentary animal bone – mostly calcined bone, or teeth and tooth enamel – were found, mostly hand recovered on site, but some from the environmental samples.

At Standingstone, various ditch, palisade and pit fills yielded a small amount of very fragmentary calcined animal bone, none of which could be identified apart from a charred cattle tooth from the Late Bronze Age ditch [101]. A single cattle tooth from the fill [38] of the main enclosure ditch (F1) was similarly the only identifiable item from Whittingehame.

Foster Law yielded a small group of bones, mostly tooth or tooth enamel with the remains of one long bone, all of them from the Iron Age inner ditch (F31), in most cases at the entrance (F30). Both cattle and horse are definitely represented (Table 8.18).

Knowes was the only site to yield a modest assemblage, and even this comprised only one box. Preservation was presumably aided by the lighter, sandy soils, although even here conditions were clearly still hostile to bone survival, since the greater part of the fragments recovered had been burnt to a white, calcined, stable state. There were a few unburnt finds, mostly decomposing flakes of tooth enamel, but also some long bone fragments.

The species positively identified at Knowes are cattle, horse and sheep/goat. There is a strong possibility that pig is also present, but no unequivocal evidence. The western ditch (F103) was the most prolific source of identifiable remains. These were principally teeth of horse and cattle, and in several cases suggest the deposition of tooth rows in skulls or mandibles, the bone of which has long since decayed. The comparatively high proportion of horse teeth is of interest in suggesting a substantial component of non-household refuse being dumped in the ditch. Other finds from here include definite sheep/goat and possible pig bone fragments. The upper ditch fill [276] produced a concentration of winkle and mussel shells.

Table 8.18
Animal bone from TLEP sites

Species	*TWT*	*TST*	*TFL*	*TKN*
cow	•	•	•	•
sheep/goat				•
horse			•	•
pig				?
indet	•	•	•	•
winkle; mussel				•

The two house areas produced few recognisable finds. Despite this, it is of interest that scoop F128 produced definite sheep/goat teeth, while scoop F160 yielded identifiable cattle teeth. None of the burnt bone from the cist in the southern ditch terminal (F221) could be positively identified as animal.

Shell fragments and a fish scale were also found in a sample taken one of the undated features (F19) outside the enclosure at East Bearford. A fragmentary large mammal longbone from a late field drain was the only other find there. Nothing was recovered at East Linton.

ENVIRONMENTAL SYNTHESIS

All told, 360 bulk samples were taken from the six TLEP sites, all but 43 coming from Knowes, Standingstone and Whittingehame. Methodology was the same across the sites with, initially, 5-litre sub-samples being assessed. Those that produced moderate numbers of seeds were normally taken to full analysis. The validity of this approach was tested at Whittingehame, where a randomly selected group

Table 8.19
Summary of plant remains from TLEP sites

Taxon	*TFL*	*TKN*	*TST*	*TWT*	*Total*
Cerealia indet	4	175	46	252	477
Avena grain		2	3	207	212
Avena awn			16	4	20
Hordeum indet.	1	214	27	79	321
Hordeum naked			6		6
Hordeum hulled	10	327	69	625	1031
Hordeum rachis internode		27	18	2	47
Hordeum 6-row rachis internode		37	10		47
Hordeum basal internode		3	2		5
Triticum sp(p). grain		80	19	5	104
Triticum dicoccon		3	7	4	14
Triticum dicoccon spikelet fork		9	18		27
Triticum dicoccon glume base		45	51	1	97
Triticum spelta glume base	2	29	7		38
Triticum sp. spikelet base		20			20
Triticum glume base	1	13	16	2	32
Triticum aestivum internode				1	1
Triticum brittle rachis internode		2	4		6
Culm nodes		1	4	1	6
Arrhenatherum elatius ssp. *bulbosum*		2			2
Bromus sp(p). grain			4	3	7
Calluna vulgaris twig		1			1
Carex (lenticular)		26	3	1	30
Carex (trigonous)		82	1	3	86
Chenopodiaceae undiff.			3	1	4
Chenopodium album		12	3	8	23
Chrysanthemum segetum				1	1
Cirsium sp.		1			1
Compositae (head/pappus)				14	14
Corylus avellana nutshell	2	10	29	14	55
Danthonia decumbens		157	7	1	165

Table 8.19 (continued)

Taxon	*TFL*	*TKN*	*TST*	*TWT*	*Total*
Empetrum nigrum fruit		1			1
Fallopia convolvulus			2	3	5
Fucus – thallus/frond			1	97	98
Galeopsis tetrahit				2	2
Galium aparine			2		2
Legume < 4mm				7	7
Malus/Pyrus			6		6
Mentha sp.		1			1
Montia fontana		1			1
Persicaria lapathifolia	1	19	2	6	28
Persicaria maculosa		2			2
Pisum sativum				2	2
Plantago lanceolata	1	12	5	1	19
Poaceae	1	80	11	2	94
Polygonaceae undiff.		3	4	7	14
Polygonum aviculare		1			1
Polygonum convolvulus		1			1
Potentilla erecta		1			1
Pteridium aquilinum			2		2
Ranunculus repens-type		1		1	2
Raphanus raphanistrum pod		1	1		2
Rumex acetosella		4			4
Rumex obtusifolius-type	2	29	1	7	39
Stellaria media				1	1
Veronica hederifolia		3			3
Vicia sp.		1			1
Total	25	1439	410	1365	3239
Total volume processed (samples with material)	55	678	348	435	1516
Average items/litre	0.5	2.1	1.2	3.1	2.1

of barren samples was fully processed as a control. No more than the occasional seed was recovered and it was decided that, for these types of soils, assessment of 5-litre sub-samples was an efficient way to proceed. This would not necessarily apply to other sites or soils, but it is suggested that such a methodology is tested elsewhere.

Many samples produced few if any plant remains limiting the interpretation of some of the sites. East Linton produced no useful assemblage of plant remains, but given the Late Bronze Age date on the single wheat grain from the inner ditch, supported by another from the palisade, it is disappointing that no other grain was recovered. East Bearford seems likely to be contemporary with Knowes, but the single emmer glume base had too low a graphite yield for dating. This overview of crop husbandry practices will therefore focus on the three main sites and Foster Law, which between them represent well over three millennia of activity from the Neolithic to the start of the Early Historic period.

In almost all cases preservation of plant remains was by charring with uncontroversial evidence of waterlogging found only in the base of the ditches at East Bearford and Knowes. The remains from East Bearford suggest dumping of heather and bracken into the ditch, but otherwise little indication of anything except ruderal communities nearby. Knowes likewise yielded primarily ruderal taxa. The water flea egg cases at East Bearford suggest the presence of water in the ditch at least temporarily, but there was no evidence for standing water over any length of time.

As expected of charred assemblages, cereal grains and chaff were the most commonly recovered taxa. There were, however, only approximately 4200 plant remains in the four main assemblages, reducing to just over 3200 when the cache of burnt grain from Standingstone is excluded (Table 8.19). This equates on average to only 2.1 seeds/litre, with Whittingehame ironically exhibiting the highest recovery rate of the three main sites despite having the most intractable soils, although this is largely due to the grain-rich samples from the latest phase.

Barley (*Hordeum* sp) was by far the most commonly recovered grain, representing 45% of the total assemblage and 72% of the identified cereals, with most being the hulled variety. A small amount of naked barley was present at Standingstone. All determinable rachis internodes were from the 6-row *Hordeum vulgare*, which is the most commonly recovered barley until the medieval period. Wheat (*Triticum* spp) represented less than 11% of the assemblage and oats (*Avena*) only 7%. No oat chaff was present and therefore it is not possible to say whether the oats were cultivated or wild, although the low numbers at Knowes and Standingstone point towards wild. Nearly all the oats came from the mid-first millennium AD occupation at Whittingehame, where they formed around 23% of the identified grains. Oats become more common from the first centuries AD and by the seventh century AD can be dominant, which possibly reflects the generally accepted downturn in climate at this time (Lamb 1981). Wheat grains are not reliably determined to species (Hillman *et al.* 1996), but the chaff shows that both emmer (*Triticum dicoccon*) and spelt (*T. spelta*) were being used.

Even without the cache, emmer is most abundant at Standingstone in terms of both chaff and grains. The grains showed the characteristic high dorsal ridge and slight twist over all. Spelt and emmer are more or less equally represented at Knowes, which might well reflect the Late Iron Age to Roman date of the site. This would fit with Standingstone, where spelt is only present in contexts relating to the Later Iron Age occupation, and Foster Law, where it was associated with the later enclosure. Evidence from Port Seton (Huntley 2000) and several sites in north-east England (Van der Veen 1992) points to emmer remaining the dominant wheat until the Roman period north of the River Tyne. This dominance is further emphasised when Whittingehame is considered; although hardly any identifiable cereals were recovered from the earlier phases of occupation, emmer is the only wheat certainly present in the late phase, although it has to be admitted, in very low numbers.

Evidence for other crops or foodstuffs is rare – two peas (*Pisum sativum*), fragments of apple (*Malus*), and hazel nut (*Corylus avellana*). The latter two were almost certainly growing around the area. Weed seeds are not common in any of the sites. This may reflect the lack of crop processing debris in any quantity although, as suggested for Whittingehame, it also might reflect poor preservation. In terms of percentage of the grain + chaff + weed assemblage however, weeds vary with Foster Law = 25% of 20 seeds, Knowes = 36% of 1240 seeds, Standingstone = 22% of 225 seeds and Whittingehame = 6% of 1243 seeds. Those that are present demonstrate presence of well-manured, nutrient enriched soils with some damp areas and some grassland. Turves are almost certainly represented at all sites to some degree. The few weeds characteristic of more modern deposits

are only present in Whittingehame, for example *Chrysanthemum segetum*, the corn marigold.

For the wider region, the obvious comparator is Port Seton – on the coast just over 10km from Foster Law and a little over 20km from Knowes – where two major assemblages of plant remains were studied. At both Fishers Road West and East, the main activity lay in the late centuries BC and early centuries AD, with some later agriculture (Haselgrove and McCullagh 2000). They therefore coincide closely with Knowes and have a significant overlap with other TLEP sites. Their plant remains, too, were dominated by barley, but spelt wheat was quite an important component at Fishers Road East, as evidenced by its chaff (Huntley 2000), whilst naked barley was recorded at Fishers Road West (Miller *et al.* 2000). Both Port Seton sites produced a little bread wheat (but with one sample radiocarbon dated to the Later Iron Age, the other Early Historic) and somewhat more oats. As with the TLEP sites, seed concentrations at Port Seton were generally low: at Fishers Road East, they averaged 1.8 seeds per litre, whilst weeds represented 35% of 5422 grain + chaff + weed seeds.

Barley is the most commonly recovered cereal throughout and oats only seem to be a definite crop at Whittingehame. In other respects, Whittingehame appears conservative in its use of cereals; whilst spelt never became a dominant crop at any of the TLEP sites, even the post-Roman occupants of the enclosure did not seem to use it at all. This raises the question whether they were essentially practising animal husbandry and relying on trade with other sites for cereals; alternatively they may only have been using the abandoned site for very specific purposes (Chapter 3). Knowes and Standingstone seem to have produced wheat for themselves, although still a minority crop. Whittingehame is different too, in the small amount of weed seeds recovered, although this might be partly due to poor preservation.

Turning briefly to animal husbandry, the only faunal assemblage of any consequence, from Knowes, confirms that its inhabitants kept cattle, horses and sheep/goat and had access to coastal resources. Only the remains of large, robust species are present at the other sites: cattle and horse at Foster Law, cattle at both Whittingehame and Standingstone. If the Port Seton sites with their better preserved and more plentiful assemblages are any guide, sheep is likely originally to have been the commonest species by number, at least in the Iron Age phases, and pig, dog and deer would all also have been expected (Hambleton and Stallibrass 2000; O'Sullivan 2000). Large domestic mammals also dominated the similarly poorly preserved faunal assemblages from the later prehistoric A1 sites, which did however yield more records of sheep/goat as well as some definite identifications of pig: at Biel Water, Eweford Cottages and South Belton (Lelong and MacGregor 2007, 127).

In summary, the TLEP sites fit well within the subsistence pattern in lowland Scotland so far as there is one. Barley is the most frequent cereal with rather less wheat. Both emmer and spelt are present, with hints that spelt became more common in the Later Iron Age, although emmer is clearly preferred at all sites studied. Little evidence of specific crop processing stages was apparent at site level, but the presence of moderate amounts of chaff suggests local production. There do seem to be differences between Whittingehame and the other TLEP sites, including the presence of seaweed in some quantity; these may relate to the late date of the main deposits sampled there and/or nature of activity in the enclosure in the post-Roman period, as well as poor preservation.