CHAPTER 29

Environmental overview

by Wendy Carruthers

29 An environmental overview

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Archaeological deposits at Stansted Airport are located on a clay plateau rising to around 90-100 m aOD. The plateau is cut by a number of watercourses, including an undated palaeochannel that crosses the northern area of the site from east to west. The main watercourse still in existence today is Pincey Brook, which flows across the south-eastern corner of the excavated area and eventually meets the River Stort near Harlow. Early farmers would have found the clay soils difficult to work, and waterlogging would have been a problem in the lower-lying areas of the site. The clay ranges from calcareous to non-calcareous in different areas, but chalky till is the predominant geological substrate (Macphail and Crowther).

Before the Middle Bronze Age

Although development associated with Stansted Airport over the past two decades has led to the recovery of a large amount of environmental information concerning Middle Bronze Age and later settlement in the area, very little is known of the first forests that developed on the clay plateau following the last glacial period. The lack of suitable pollen-bearing deposits in the area means that records of human activity prior to the Middle Bronze Age are sparse and poorly dated.

A palaeochannel sequence was investigated at Stebbingford, Felsted (Murphy and Wiltshire 1996), about seven miles east of Stansted. The pollen evidence indicated an open landscape with birch and pine, suggesting that an early Holocene or Late Devensian date was probable, although no scientific dating was obtained. Charcoal fragments were frequent in the samples, perhaps indicating that human activities were taking place during the Mesolithic.

Excavations at Stansted Airport during 1986-91 (Wiltshire and Murphy 2004a) produced a pollen and plant macrofossil sequence through a palaeochannel at BRS, to the north-west of the Airport near Stansted Brook. Although not scientifically dated, the evidence suggested that, at the time the earliest sediments were accumulating in the channel in the Early Bronze Age, the surrounding vegetation consisted primarily of alder fen carr on the wetter land along the channel, with lime/oak/hazel woodland on the drier soils. The relatively high level of lime pollen indicated that lime woods must have been growing nearby. The presence of microscopic charcoal could indicate some clearance, but there was no pollen or plant macrofossil evidence for cereal cultivation in the area.

Excavations at Stansted Airport discussed in this report revealed a palaeochannel (327003) in the northern half of the MTCP site located fairly high up the slope, running parallel to the Pincey Brook. The earliest sediments provided some evidence for livestock management, including possible stabling refuse and indications of trampling (Macphail and Crowther), Unfortunately, pollen from this feature was too poorly preserved to be useful (Wiltshire).

An Early Neolithic tree throw on the SG site produced a few poorly preserved cereal grains and a trace of free-threshing wheat (a chaff fragment). However, a radiocarbon date on some flax seeds from this feature demonstrated that contamination had occurred, so the origin of these cereal remains is suspect. At the MTCP site there were some indications that ceremonial activities were taking place during the Neolithic period. The lower fill of a Neolithic pit, 353011, produced possible ritually placed deposits of worked flint and a few poorly preserved charred plant remains. These included a bread-type wheat grain and frequent small fragments of hazelnut shell (NZA-20960: 3640-3490 ±35 cal BC), indicating that both cultivated and wild food resources were being exploited. Since only a few, eroded and fragmented charred plant remains were present, the cereals could have been brought to the site for ritual purposes, rather than been grown on the local clay soils.

Small quantities of residual Mesolithic and Neolithic worked flint from features such as the Middle Bronze Age barrow at the MTCP site were further evidence that low level activities were occurring in the area through the early prehistoric period. In addition, a small number of Mesolithic/Neolithic tree-throw features, Neolithic features and a few scatters of flintwork were excavated, suggesting that small clearings may have been made from time to time in an otherwise relatively undisturbed, forested landscape.

A similar scarcity of evidence for early anthropogenic activity was encountered on the nearby A120 sites, with scattered finds hinting at a comparable level of later Mesolithic to Early Bronze Age small-scale clearances (Timby *et al.* 2007). The earliest clear evidence for settlement was at Greenfields, where Mid/Late Bronze Age activity was focussed around a pingo and produced evidence for metalworking. Even though significant quantities of pottery were present at this site, the economy was still possibly primarily pastoral in nature, since only traces of charred cereal remains were recovered.

Taking the evidence as a whole, it seems likely that the heavy, boulder clay soils in the Stansted area were not brought into cultivation to any significant extent until at least the Middle Bronze Age. The clay soils are difficult to work, often liable to seasonal waterlogging, and are said to be of limited use for spring cultivation (Jarvis *et al*. 1983). Prior to the introduction of iron ploughshares and spelt wheat, a hardy hulled wheat better suited to cold, clay soils than emmer (Jones 1981), the Stansted landscape appears to have remained predominantly wooded, perhaps with short-lived, small clearances being made by small groups of people. Larger scale, more settled occupation in the Essex region appears to have been primarily occurring on low-lying land around the coast, fens and river valleys (Brown and Murphy 1997), as demonstrated by the substantial charred plant evidence from The Stumble (Murphy 1989). Both wild plant foods and a variety of

cultivated crops (including mainly emmer wheat, with some bread-type wheat, naked barley, einkorn and cultivated flax) were recovered from the Stumble, indicating that the economic basis of the settlement was diverse and well established.

Middle Bronze Age

Evidence of human activity was more substantial for the Middle Bronze Age, consisting of scattered features at the M11 site to the west and a settlement of post-built roundhouses on the MTCP site to the east. A greater quantity of environmental information was recovered because the low-lying nature of the deposits led to the preservation of waterlogged organic remains. Despite the presence of the settlement, however, charred cereal assemblages were limited to two pits; one close to roundhouses at MTCP and one near a large pit group dating from the Middle Bronze Age to Early Iron Age at the M11 site. The first of these (pit 322014) produced a small amount of emmer and spelt cereal processing waste from a top fill, probably derived from the piecemeal processing of grain prior to cooking. The second sample, from the base of pit 423049, produced an assemblage that was richer in grain, chaff and weed seeds. It may have originally consisted of burnt whole ears or spikelets, complete with twining/scrambling weeds such as cleavers and black bindweed. Again, both emmer and spelt wheat were identified, with a small amount of barley and possible oat. The frequency of cleavers seeds suggested that at least some of these crops were being autumn-sown. Perhaps the cultivation of both emmer and the hardier crop, spelt, allowed the work and risk to be spread over both seasons of cultivation. As noted earlier, the heavy clay soils are better suited to autumn sowing, so the introduction of spelt wheat in the Middle Bronze Age could well have been a reason for the expansion of settlement onto the Essex boulder clay in this period. Small quantities of hazelnut shell in some of the samples showed that wild food resources were still being exploited.

The structure providing the most information about the Middle Bronze Age landscape was the remains of a barrow constructed on the floodplain near Pincey Brook (see Chapter 4). According to the dating evidence, the barrow may have been constructed before the settlement at the MTCP site, but it continued to be used for funerary rites, as demonstrated by the charcoal and cremated bone on the site. A radiocarbon date from the middle of the sequence of silting up produced a date of 1435 BC to 1272 BC cal. Trees and shrubs that may have been used for pyre fuel included hazel, hawthorn/*Sorbus* -type and probably oak (Gale). Pollen samples, soil thin sections and bulk samples, waterlogged plant macrofossils and insect remains from sediments accumulating in the ring ditch (324078) were analysed, providing details of the surrounding landscape during use of the monument. All of the evidence indicated a predominantly open, grassland environment around the site at MTCP, to the east of Stansted Airport. Much of the clearance appears to have taken place before the construction of the barrow, and Middle Bronze Age tree-throw features were found on several of the sites excavated. Pollen counts from the lower levels of silting of the ring-ditch indicated a less than 20% tree cover, falling to 5% (Huckerby *et al*.), and nearly all of the terrestrial insects were species associated with grassland (Robinson). Alder, hazel and sporadic larger trees existed nearby but there was no substantial tree cover close to the barrow, since only 1% of the

beetles were dependent on wood or trees (Robinson). The pollen evidence suggested that some cereal cultivation was taking place in the vicinity of the monument (Huckerby *et al*.), although cereal pollen could also have come from crop processing activities taking place nearby, or from the ritual deposition of cereal-based foods and grain.

The barrow ditch appears to have held standing water from the time of its construction, since seeds from plants such as the aquatic buttercup crowfoot (Carruthers) and duckweed (Carruthers, Robinson) and their associated insect taxa were frequent, and organic preservation was good. The fluctuation of the water table increased through time, bringing about the formation of peat within the ditch (Macphail and Crowther). The environmental evidence as a whole suggested that human activity in the area was only ever at a low level, with no indication from the insect assemblage that settlement features occurred nearby (Robinson). However, worked wood including off-cuts, wood chips and stakes of elm, field maple, alder and oak was present in the lower ditch fills, demonstrating that some activities were taking place close to the ditch. These remains may explain the presence of a few plant macrofossils from woody plants in the ring ditch, such as sloe, hawthorn, blackberry and cf. maple, or they may be derived from material brought onto the site in dung, for leaf fodder or perhaps for human food. Marsh insects and plant remains were relatively infrequent, suggesting a sharp change in the vegetation from the water-filled ditch to dry grassland. The plant and insect remains were indicative of pasture rather than meadows, and the recovery of dung beetles confirmed the presence of grazing animals (Robinson). However, nutrient enrichment of the ditch sediments was not excessive, according to the plant assemblage (Carruthers) and soil phosphate levels (Macphail and Crowther). Therefore, grazing must have been occurring at a fairly low level in the vicinity of the barrow, as water-filled features inevitably attract animals coming to drink.

There was some pollen evidence to suggest that small trees/shrubs such as alder, hazel and field maple may have increased as the barrow fell into disuse. Pollen from the top of the ditch sequence and from the upper layers of a waterlogged pit (316118) close to the barrow showed an increase in these taxa, perhaps indicating scrub regeneration or an increased use of hedgerows.

A finds-rich waterhole (309075), located close to roundhouses in the entrance to the settlement, produced high phosphate levels and abundant soil micromorphological evidence to suggest that livestock had been trampling the damp soils around the margins (Macphail and Crowther). In contrast, waterhole 302043, south-west of the settlement, produced much lower phosphate levels and fewer signs of trampling.

To the west of the airport on the M11 site, a Late Bronze Age waterhole, 430084, produced well-preserved plant macrofossil and insect assemblages that suggested that, at the time the sampled deposits were formed and in this area at least, scrub or woodland was an important component of the landscape. The insect remains showed that the waterhole held stagnant water, and thirteen percent of the terrestrial beetles were from wood or tree-dependent taxa. There was some evidence for pasture, and beetles that feed on the dung of large herbivores were fairly frequent (13%), but there was no evidence

that human habitation existed nearby. The waterlogged plant remains confirmed this description of the local environment. Aquatics such as crowfoot, buttercups and duckweed were frequent, suggesting that the waterhole was not intensively used by humans. In contrast, most of the waterholes at Perry Oaks, Heathrow (Carruthers 2006) contained very few aquatics, probably because they were kept clear of vegetation during the main period of use. Indicators of nutrient-enriched soils, such as stinging nettles, chickweed and docks, were abundant, and this was probably due to use of the waterhole by grazing animals. The deposition of domestic waste may also have been responsible for raising the nutrient status, as pot sherds were frequent in some layers of deliberate backfill, and a few fragments of economic plant waste were recovered (an emmer/spelt glume base and three fragments of cultivated flax capsule). These remains demonstrate that the cultivation of hulled wheat and flax was probably taking place locally, but that this was on such a small scale or over a short period that few environmental remains were preserved. The wide range of plant taxa from woodlands or scrub (including alder buckthorn, hawthorn, blackthorn, maple, rose, elderberry and blackberry) reinforce the insect evidence that this type of vegetation occurred nearby, particularly since twigs, thorns and leaf fragments were present. As all of the taxa were of a scrubby nature it is possible that the seed and insect samples represent a period of abandonment of the feature, when livestock may still have been using the waterhole but humans had started to backfill it with domestic waste. Scrub rapidly grows up around abandoned features of this type (Mark Robinson, pers. com.), particularly nitrophilous shrubs such as elderberry. However, numerous Middle Bronze Age and later waterholes at Heathrow (Perry Oaks and T5, Carruthers 2006) have produced evidence indicating that hedgerows, scrub or woodland had been growing nearby, even where primary fills producing little domestic waste were examined. Perhaps waterholes were positioned in the corners of hedged fields, or in clearings within scrub/woods. This is a subject worthy of further investigation.

Sheep and cattle were the main domesticates during the Bronze Age at Stansted, according to evidence from the bone assemblages, with small amounts of horse, goat and pig (Bates). By far the largest number of bones (>90%) came from the settlement site at MTCP, with 45% being derived from waterhole 309075 and most of the remainder being found in pits to the west and south-west of the settlement (Bates). A small number of red and roe deer bones in the samples from the MTCP site and an aurochs tibia from the barrow ditch provided evidence of some of the wild artiodactyls that could have been hunted in surviving areas of woodland.

Taking the structural and environmental evidence as a whole, the Middle Bronze Age landscape appears to have been a mixture of surviving woodland on the boulder clay plateau which provided opportunities for hunting game and gathering wild fruits and nuts, with lightly grazed grassland over much of the remaining slopes. The range of larger woodland trees represented included oak (charcoal and worked wood), and elm (worked wood), with the smaller trees/shrubs hazel, field maple and hawthorn/*Sorbus*-group growing as an under storey. It was not possible to determine precisely how heavily wooded the plateau was without further pollen samples being taken from a variety of locations away from the river valleys, but the fact that pollen samples from features at the

M11 site, some distance west of the settlement also produced low tree/shrub percentages (<25% and <10%) suggested that the landscape was predominantly open. It is uncertain to what extent livestock was allowed to range free, combining woodland browsing with grazing the grassy slopes, as there was little archaeological evidence of divisions within the landscape at this time, beyond the immediate settlement enclosures. However, the plant macrofossil and insect evidence from waterhole 430084 suggested that hedgerows were probably present, and these were being cut and/or browsed sufficiently short to reduce pollen production to a low level. Thorny hedgerow taxa such as hawthorn and sloe are insect-pollinated low pollen producers, so deliberately planted and maintained thorn hedges would not easily be detected in pollen diagrams.

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The valleys retained areas of alder fen carr on the wetter ground, judging from the pollen, worked wood and charcoal evidence. In areas of the valley bottom where the soils were less heavy than the plateau clays but not permanently wet, arable cultivation may have been possible. The pollen evidence suggested that cereal cultivation was taking place close to the settlement and close enough to all of the Middle Bronze Age features from which samples were taken to register in the pollen diagrams. Little information about the precise location of the arable fields was recovered from the small charred weed seed assemblages, but there was only a slight suggestion that heavy clays or damp soils were being cultivated (one sedge seed only). In addition, the absence of calcareous sediments in the barrow ditch suggested that there was no cultivation taking place upslope of the monument to cause erosion of the chalky till plateau (Macphail and Crowther). The presence of rubbing stones or quern stones in the settlement features, cereal and some arable weed pollen in all of the waterlogged features studied, and several charred emmer, spelt and barley remains in a few features suggested that cereals were probably being grown locally, rather than being brought into the area. In particular, the possible storage of emmer and spelt spikelets or ears in pit 423049 (M11) suggested that these may have been locally grown crops. Arable cultivation may not have been taking place on a large scale, however, since very few of the settlement features produced charred cereal processing waste or accidentally burnt grain (although, of course, it is dangerous to rely too heavily on negative evidence, as processing areas may simply have been missed). Thus, the settlement appears to have been located on the boundary between several different vegetation types, so that grazing, arable cultivation and sources of fuel and water would all have been in close proximity to the inhabitants.

Late Bronze Age/Early Iron Age

Features dated to this period were fewer in number and more scattered, suggesting a decline in settlement density during the Late Bronze Age. In addition, domestic waste such as bone and charred plant remains was scarce. Cattle and sheep/goat were identified from the seven identifiable bone fragments, and the only charred plant remains recovered were a few emmer/spelt wheat and barley grains, a trace of hulled wheat chaff, a few weed seeds and a hazelnut shell fragment from two Late Bronze Age and an Early Iron Age pits on the M11 site. When added to the increased evidence for scrub or woodland, as outlined below, this suggests that the balance between open grassland and

woodland/scrub moved towards a more closed, scrubby or wooded landscape during this period in comparison with the Middle Bronze Age.

Unfortunately no pollen samples were examined from this period, so quantitative comparisons with the percentages of tree pollen in the Middle Bronze Age samples cannot be made. The charcoal evidence showed that a similar range of large trees and shrubs was being exploited for fuel during the Late Bronze Age/Early Iron Age as in the Middle Bronze Age, although the absence of alder charcoal from the Late Bronze Age onwards indicates that alder fen carr in the valley bottoms had by now been lost. The decline of alder and hazel pollen were observed in pollen diagrams such as the Middle Bronze Age barrow ditch (Wiltshire; Huckerby *et al*.).

The burnt mound samples from the LTCP site (BAACP01) produced primarily oak and hawthorn/*Sorbus* group charcoal, with blackthorn, ash, elm, hazel and willow/poplar. Most of these taxa were also present in five Late Bronze Age and Early Iron Age pits on the M11 site, except willow/poplar, but with the addition of frequent field maple fragments in two of the Early Iron Age pits. No significant differences were observed in the charcoal assemblages from pits with placed deposits, such as pit 423143 which contained a pot, so fuel does not appear to have been specifically selected for ritual purposes. The continued availability of a wide range of large wood (eg oak, ash, elm) and shrubby/hedgerow taxa (eg hawthorn group, blackthorn, hazel) into the Late Bronze Age and Early Iron Age suggests that sufficient woodland still existed nearby to provide ample fuel.

Middle Iron Age

As with the Late Bronze Age/Early Iron Age, the evidence for settlement during this period was scarce, consisting of small agricultural settlements with no evidence for divisions of the landscape. The only environmental remains recovered were charcoal fragments from a Mid/Late Iron Age hearth on the M11 site; feature 430042. The hearth, which was associated with the ring-gully of a roundhouse, produced no food remains, only a few small fragments of hawthorn/*Sorbus*-group and blackthorn charcoal.

Late Iron Age/Early Romano-British

Evidence for settlement was more substantial from this period, with the first clear evidence for use of the clay plateau. Other indications of a change in the scale of agricultural activities were the enclosure of large fields linked by droveways, and the greater frequency of quern stones. Soil micromorphological studies of enclosure ditch fills, droveway deposits and a ring-ditch (Macphail and Crowther) revealed some evidence of trampling, and the incorporation of phosphate, small charcoal and fine organic material (enclosure 113048, enclosure 109166, ring gully 129162, droveway 109189), but in most cases increases in these anthropogenic indicators were not great. Quantities of bone fragments and charred cereal remains, however, were notably greater, with over twice as many bones being recovered from the Iron Age to early Romano-British period samples as the Mid to Late Bronze Age samples, and with charred plant

remains concentrations rising tenfold from the Middle Bronze Age to the Late Iron Age/early Romano-British (from around 3.6 fragments per litre (fpl) in the Middle Bronze Age samples to an average of 39.1 fpl for the Late Iron Age, Late Iron Age/early Romano-British and early Romano-British samples).

As in the Bronze Age, the main domesticates were cattle and sheep/goats (probably mostly sheep) with cattle making the greatest contribution of meat to the diet. Pigs, horses, goats and dogs were represented to a lesser extent. Most of the bone and charred plant material was recovered from ditch fills, rather than pits, gullies and postholes. Taking taphonomic biases into account, the pattern of bone distribution and age at death patterns pointed to the slaughtering and butchery of livestock on site, with cattle being used for meat and milk, sheep often being slaughtered early for meat but probably also being used for wool and milk, and pigs usually being slaughtered early for meat. Small numbers of deer bones indicated the continued hunting of wild species (Bates). The recovery of small quantities of marine shells (oyster, bivalve and cockle) from a ditch at BAAMP00 confirmed that foodstuffs were being traded and brought to the site from some distance (Wyles).

Midden material deposited in the ring-gully of a roundhouse (feature 430039) contained pot, bone and a large concentration of charred cereal remains. The cereal assemblage consisted mainly (>80%) of hulled wheat (emmer/spelt) and hulled barley grain, with a few weed or cultivated oat grains. Being a mixed midden deposit, the few fragments of chaff, frequent weed seeds and hazelnut shell fragments may not have been derived from the same charring events as the grain, so interpretations based on crop processing activities may be unreliable. As a whole, the assemblage probably represents a variety of household waste ranging from the accidental charring of grain being prepared for cooking, waste chaff and weed seeds picked out of the crop during piecemeal grain cleaning prior to cooking, and the waste from the consumption of other ‘snacks’ such as hazelnuts.

For the Late Iron Age and early Romano-British period as a whole the arable aspect of the economy appears to have been well-developed. Spelt wheat was probably the main cereal grown for human consumption, although emmer and hulled barley continued to be important. Bread-type wheat made its first appearance in these samples and increased in occurrence as the Romano-British period progressed. It is probably grossly under-represented in the charred plant record, since it is a free-threshing cereal and so is less likely to become charred than emmer and spelt. Oats may have started to replace barley as a fodder crop to some extent in the early Romano-British period.

A range of new weeds of cultivation occurred from the early Romano-British period, possibly having been introduced in imported spelt wheat (eg London, Straker, 1984), including corn cockle, small-flowered buttercup and *Lolium perenne/rigidum*. However, stinking chamomile, a weed of heavy, clay soils, did not occur prior to the mid Romano-British period. Perhaps enclosures on the plateau were primarily used for low-level livestock rearing in the Late Iron Age /early Romano-British, rather than for arable crops. Other damp ground weeds, such as spike-rush and sedges, were notably more frequent in

the Late Iron Age/early Romano-British and early Romano-British samples than at any other time, indicating that most of the cultivation may still have been taking place on the lower lying ground near Stansted Brook at the LTCP site. Another significant category of weeds that was well-represented in the Mid/Late Iron Age sample discussed above and in all of the Late Iron Age, Late Iron Age/early Romano-British and early Romano-British samples was the small-seeded weed vetches (<2 mm diameter seeds of *Vicia/Lathyrus* sp.). These are characteristic of nutrient-depleted soils (Moss 2004), so their abundance suggests that, although arable cultivation appears to have been occurring at a greater scale, yields per unit area of land may have been dropping because manuring was not yet being practised or was insufficient to meet the needs of the cultivation regime. Using van der Veen's description of agricultural systems (2005,158), the Late Iron Age / early Romano-British economy was probably operating along the lines of an extensive agricultural system (low input, large area of land).

Unfortunately no pollen samples covering this period were available to determine the extent of woodland clearance, but charcoal from nine features, including four cremation burials, provided some useful evidence for the availability of woodland resources (Gale). Whilst oak and ash were the dominant woods used as fuel for the funeral pyres at LTCP, oak heartwood was scarce and most of the fragments comprised narrow roundwood. Gale suggests that this may indicate a scarcity of large timbers nearby, since largewood would have been the most suitable fuel to create a stable platform and long-lasting fire. The recovery of roundwood suggests that coppicing may have been practiced in order to manage valuable woodland resources in a sustainable way. Roundwood was also recovered from a ditch deposit containing household waste, indicating that domestic fuelwood was also derived from a managed resource. The range of other species used for the pyres and domestic fuel were shrubby species such as hazel, hawthorn/*Sorbus* group, willow/poplar, field maple and blackthorn. These could have come from the trimming of hedgerows, from woodland margins or areas of scrub.

Mid and late Romano-British

A well-developed agricultural system continued to be in operation through the Romano-British period, with some signs, from the creation of new enclosures and droveways, that the settlement was expanding, and perhaps becoming more intensive in the level of effort being expended. Settlement was still primarily taking place on the edges of the plateau and valley slopes, with most of the evidence coming from the LTCP and MTCP sites, but there was some evidence for use of the boulder clay plateau (see below). Industrial activities were also taking place, such as metal-working, and these would have required a steady supply of fuelwood to have been available in the locality.

The dominance of beef as a source of meat over sheep/goat became even greater during the Romano-British period, and there was evidence from the presence of primary butchery waste that animals were being slaughtered and prepared on site. Cattle were being used for meat, traction and milk. Small numbers of sheep/goat, pig, horse, deer, and domestic fowl bones indicated other sources of meat, wool and transport (Bates). The importation of marine shells to the site increased, although shellfish was still being

consumed as a dietary supplement rather than a major component of the diet. The evidence suggested that the oysters had probably come from managed beds on the East coast (Wyles).

Evidence for the arable aspect of the economy came primarily from the MTCP and LTCP sites, with a single rich sample coming from the LBR site. Most of the rich, charred assemblages came from the enclosure ditch surrounding the late Romano-British corn-drying oven 338022, or from features associated with the oven. The oven had been used to dry spikelets of spelt wheat in order to remove the husks, and the evidence suggested that the crop had been remarkably pure and free of relict crops and weeds. Although no pure malting waste was recovered, the oven may have been used for malting from time to time. Spelt cultivation appears to have been occurring on a much larger and more closely regulated scale than before, perhaps in order to produce surpluses to trade. Other crops represented by small numbers of charred remains were bread-type wheat, emmer, oats, rye, possible peas and flax. Barley was much less frequent in this period than before, perhaps because oats and rye had replaced it as fodder crops. Wild foods including hazelnut shell, sloe, rose and hawthorn were recovered from several samples and no imported fruits, herbs or spices were recorded, suggesting that the diet may have been fairly rural and monotonous in character. However, pollen from a possible cess pit or waterhole, 347041, provided hints of the types of foods that may have been consumed, but for which the evidence is rarely found in charred assemblages. A single grape pollen grain probably indicated an occasional luxury food, and frequent Apiaceae (carrot, coriander, dill, etc.) pollen and a possible charred wild carrot seed could represent use of carrot seeds for flavouring and/or medicinal purposes (although admittedly the evidence is slim). Lust (1974) notes that an infusion of wild carrot seeds can be used as a diuretic or to cure flatulence. The roots were probably also eaten, but for the pollen to have been preserved in this feature seeds were likely to have been eaten.

The arable/disturbed ground weed, stinking chamomile (an indicator of heavy, damp, clay soils) was recorded for the first time in several samples, and small-seeded weed vetches were much less common than in the previous period. These differences suggest that arable crops were now being grown on the boulder clay plateau. Although difficult to plough initially, clay soils can be rich in nutrients. They would have been well-suited to the cultivation of spelt and bread-type wheat. Crops such as oats, rye and flax may have continued to have been grown on the damper, lighter soils of the valley bottom, as they are more tolerant of poor, acidic soils. An additional reason for the reduction in leguminous weeds may be the increased use of manuring during the mid to late Romano-British period, or perhaps the cultivation of peas in rotation with cereals. Peas were recovered from a mid Romano-British ditch 109214 on the LTCP site. Possible evidence for manuring was the fact that small, abraded pot sherds were more widely spread during this period. This increased input of effort, high level of output but limited evidence for the expansion in terms of area of land under cultivation, all suggest the intensification of effort being put into the existing farming system (van der Veen 2005).

Charcoal recovered from features, a hearth, the corn-drier and a pit near the smithy on the MTCP site indicated that the same range of taxa was being exploited for fuel as in the

previous period, and that woodland management was still taking place. Fast-grown roundwood was present in charcoal from the feature near the smithy. However, pollen evidence from the late Romano-British enclosure ditch, feature 143007, at LTCP site to the north-west suggested that very little woodland remained in the catchment area. Of course, pollen production would have been affected by woodland management practices such as coppicing, pollarding and the regular cutting or layering of hedges. Grassland taxa, ruderal weeds, cereal pollen and arable weeds were all frequent in the ditch sequence, although meadows and grazed pastures were thought to be the dominant vegetation type in this area (Huckerby *et al*.). Soil thin sections from the enclosure ditch produced only slight evidence for the input of anthropogenic inclusions and a small amount of evidence for animal trampling (Macphail and Crowther). It is possible, then, that the focus of activity at the LTCP site was around animal husbandry on a fairly small scale, or for a short period of time. This contrasts with the results from MTCP site.

Moving towards the area that produced the most archaeological evidence for settlement (MTCP), a mid Romano-British ditch at the LBR site, 205018, produced a much larger quantity of cereal pollen. This may be associated with the abundant charred spelt remains from the nearby ditch 207013, since spikelets and processing waste can contain high levels of pollen (Robinson and Hubbard 1977). Both lines of evidence demonstrate that the evidence for arable cultivation and cereal processing was stronger on this site. The charred cereal results from Stansted were very similar to the findings from the A120 trunk road sites to the east of the airport, except that the large concentrations of spelt processing waste signifying arable intensification appear to occur slightly earlier on some of the A120 sites, in the early Romano-British period rather than mid to late Romano-British. In general, this production of pure spelt on a large scale seems to have been widespread from the early to mid Romano-British period onwards on the Essex boulder clay. Having been largely left uncultivated prior to this period, the fertile clay soils were obviously favoured for spelt cultivation once the technology had been developed to enable them to be ploughed. Other advances appear to have included manuring, the digging of ditches to improve drainage and the use of corn-driers to process grain on a large scale. Processed grain would have been less bulky to transport, but may not have survived so well in storage in the damp British climate. Sprouted grain was observed on all of the sites where bulk processing was taking place. The level of sprouting was too low to suggest that the main source of waste had been from the production of malt, but some malting waste may have been mixed with the dehusking waste from oven 338022. Sprouting in storage probably became more of a problem at this time because dehusking leaves the grain vulnerable to damp, as well as pests and diseases.

Late Saxon and early medieval

Very little archaeological evidence has been recovered for Saxon and early medieval settlement of the area, from either the 1986-91 Stansted excavations (Havis and Brooks 2004), the A120 sites (Timby *et al*. 2007) or the sites examined for this report (see Chapters 9 and 10). Villages became established in the river valleys and lower slopes during this period in Essex, rather than on the clay plateau. It is likely, therefore, that there was considerable woodland regeneration on the higher ground between the late

Romano-British period and the Late Saxon occupation on the MTCP and SG sites. Although no well-dated pollen evidence was obtained to confirm this suggestion, the Domesday book survey in 1086 shows the Stansted Airport area to have been one of the most densely wooded parts of Essex. The main manor at Stansted was listed as having arable land, meadows, a mill, probably a church and enough woodland to feed a thousand pigs (see Chapter 9). The documentary evidence suggests that woodland clearance, perhaps due to assarting by tenants, was occurring on all of the local manors in the 11th century, with most of the land probably being initially turned over to pasture. It shows that Stansted became a polyfocal village within large open fields and smaller demesne and tenant enclosures. Clearance continued into the 12th and 13th centuries as the population increased (see Chapter 9).

The Late Saxon archaeological evidence consisted of scattered features primarily in the MTCP and Southgate areas. A burnt building on the MTCP site, 302020, produced evidence that the building had been constructed of wattle panels with a chalky cob daub (Macphail and Crowther). Three of the four samples from the beamslots contained primarily oats. This probably indicates that it had been used to house livestock, although it could signify a change in the diet or simply represent the chance accidental burning of some stored oats. Since the few other charred waste deposits from pits produced primarily bread-type wheat, it is most likely that the building assemblage represented fodder. Stinking chamomile, an indicator of heavy, clay soils, was frequent in one pit sample, indicating that the wheat was probably being grown on the boulder clay plateau. Small quantities of rye were also recovered from the charred samples. Of particular note were eleven grains and a glume base of hulled wheat in a sample from the beamslot, since hulled wheats are rarely found in deposits later than the Romano-British period. For this reason, a well-preserved example was radiocarbon dated, producing a date of AD 960-1040 ±30 (NZA-23235). Therefore, it appears that some hulled wheat (most likely spelt) continued to be grown in the Stansted area into the Late Saxon period. Perhaps this is a reflection of how well the clay soils suited this crop. Spelt was probably grown for fodder, in which case the husks would not need to be removed and it was less likely to become charred. This could account for its scarcity in the Saxon and early medieval charred plant record.

One change to the crops being grown was the introduction of a second free-threshing cereal, rivet-type wheat. A number of medieval settlements across southern and central England have now been found to have been growing both bread-type and rivet-type wheat (Moffett 1991), perhaps because the grains have different culinary properties (one producing a well-risen loaf of bread, the other more suited to biscuit making), or maybe to ‘hedge your bets’ as they ripen at slightly different times and differ in their resistance to pests and diseases. A third possibility is the specific cultivation of rivet-type wheat for thatching, as it produces a superior, long straw. Rivet wheat is less frequent in Saxon deposits, although it has been AMS dated to the Late Saxon period at Higham Ferrers, Northamptonshire (Moffett 2007, 169).

A wider range of dietary evidence was recovered from a Late Saxon cess pit at Southgate (498020) and an early medieval cess pit north-east of this on the MTCP site (310136).

Mineralised plant remains helped to redress the charred preservation bias towards cereals, through the preservation of frequent 'chewed' fragments of legume seed coat. Amongst the numerous small unidentifiable fragments of legume seed coat, a few pea and Celtic bean fragments were identified. In the cess pit from the MTCP site, legume fragments were almost as numerous as cereal bran fragments, supporting the impression retrieved from over 20 cess pits at the Middle Saxon settlement of Hamwic, Southampton (Carruthers 2005) that legumes had been much more important in the Saxon and early medieval diet than the charred evidence suggests. Fruit remains were particularly frequent in the cess pit from the MTCP site, comprising mainly of native fruits such as blackberries and crab apple, but also some possible orchard fruits such as damson/bullace and cherry/sloe. The contents of the pit at the SG site were not so well preserved, and only a few blackberry and apple/pear seed embryos were recovered. Seasonal differences could have contributed to the differences between the pits, as well as the temporal and preservational differences, although many of the foods mentioned could have been stored for most of the year if they were dried or made into preserves. Other plants of economic importance represented in these two pits that may have been consumed for medicinal purposes or as flavourings included flax, opium poppy and cf. mustard. The presence of frequent mineralised straw or rush stems may have been due to the use of this type of material as toilet paper, or the deposition of waste flooring/bedding materials to dampen smells.

A posthole near to the cess pit on the SG site produced numerous charred flax seeds, suggesting that the processing of flax for fibre, or perhaps for oil, was taking place nearby. Very few bones were associated with the Late Saxon and early medieval features, so little can be said about this aspect of the economy except that bones from cattle, sheep/goat, pig and bantam were present in domestic waste contexts. One pit on the MTCP site (310136) produced evidence for the processing of cattle carcases (Bates).

Later medieval

By the later medieval period (*c* 13th to 15th century) a post-mill had been constructed on top of the hill, and a settlement built on the MTCP site. However, features of this date produced even fewer bone or seed-rich samples, so very little is known about agricultural practices during this period. From the very few bones recovered, the main domesticates present in the early medieval period were again represented.

Samples from the later medieval midden deposit 467008 demonstrated that oysters were being brought to the settlement to provide variety in the diet. Frequent drainage ditches running downslope from the plateau were dug close to the settlement at the MTCP site, suggesting that arable crops were being grown on the slopes. Thin sections from one of these (336090) showed that the ditch sometimes held standing water, and it was cleared out from time to time. Phosphate levels in the sediments were not greatly enhanced, so if manuring was carried out it was at a fairly low level (Macphail and Crowther). Normal practise at this time was to restore fertility by folding sheep on the arable land once the wheat had been harvested, and Dyer notes that, where sheep numbers were not sufficient, the effect on crop yields could be disastrous (Dyer 2005, 21). Unfortunately the scarcity

of bone evidence from this period means that little is known about the rearing of livestock.

The post-medieval hunting lodge

The post-medieval hunting lodge and park on the LTCP site provided an interesting example of the management of land to suit a specific purpose. Although the bone assemblage clearly reflected the activities taking place at the lodge, the plant macrofossil assemblage produced only a few signs that the plant-based diet was a little more high-status and exotic than the earlier settlements.

Evidence for management of the parkland surrounding the lodge came from a pollen sample and plant macrofossils in post-medieval pit 464035. The pollen assemblages indicated that the landscape was predominantly open grassland, with sporadic trees (Huckerby *et al.*). Charcoal from enclosure ditch 466020 comprised frequent hornbeam roundwood, oak, field maple, ash, hawthorn/*Sorbus*-type, blackthorn, willow/poplar and cf. hazel (Gale). Small quantities of pollen from several of these species suggested the presence of hedgerows or scrub, and the recovery of a few rose/blackberry and sloe/hawthorn–type thorns indicated this vegetation type occurred near to the feature. Many of the above tree and shrub species can be coppiced and are particularly well-suited to being used for hedging. The documentary evidence suggests that parkland trees were often pollarded, and different vegetation areas such as coppiced woodland, hay meadows and open hunting lawns would have deliberately been created (see Chapter 10). A single hop seed could have originated from a wild vine growing in the hedgerow. Unfortunately, the evidence was too slight to suggest that hops were being cultivated.

Pollen from cereals and possible peas/beans was also present in pit 464035 (Huckerby *et al.*). Evidence of these crops was recovered from charred assemblages nearby (see below), although burnt domestic waste was not deposited in this particular feature. Aquatic, damp ground and marginal pollen and plant macrofossils showed that the feature had held water at the time the deposits were forming. Most of the waterlogged plant macrofossils consisted of grassland and damp grassland taxa, such as cinquefoil, buttercups and selfheal. The recovery of several seeds from thistles and plantain suggested grazed pasture in the immediate vicinity, though the presence of meadowsweet pollen indicates there may have been meadows on the wetter areas.

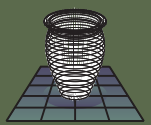
Waterlogged plant macrofossils from well 461038 provided slight clues that a formal garden and orchard may have existed at the Hunting lodge. A single possible box leaf and several bullace/damson fruit stones hint at the likelihood that this type of property would have had a garden. Clipped box hedges were popular during the 16th century, although hunting lodges were sometimes quite rustic in character so the garden may not have been formally laid out. The recovery of two grape pips could suggest the presence of a vine, but imported raisins may also have been purchased (Carruthers). Oysters were recovered from a ditch and occupation layer in the hunting lodge (Wyles), providing evidence that luxury foods were being brought onto the site.

The range of charred cereals recovered from two hearths in the hunting lodge and well 461038 was similar to the Late Saxon and early medieval pit assemblages on the MTCP site (bread-type and rivet-type wheat, a little rye and oats, peas, Celtic beans) but for the first time since the Late Iron Age hulled barley was fairly frequent. Although barley is not normally considered to be a high-status cereal, at least not for human consumption, the presence of barley could reflect the fact that the owners of the hunting lodge could afford to buy-in barley if it did not grow well locally. Alternatively, they could probably also afford the labour and manure to cultivate their fields to a level where a reasonable barley crop might grow. The presence of charred peas and beans in the two hearths suggests a fairly wholesome, rural diet, but these could be the remains from servants' meals or fodder. Peas were often used as pig food during the medieval period (Dyer 2005).

The bone assemblage demonstrated that the meat aspect of the diet was strongly influenced by the operation of the property as a hunting lodge. Although beef was still an important component of the diet and lamb/mutton and pork were being consumed, deer and birds, including game such as pheasant, made up significant proportions of the assemblage. Features such as the latrine, 447014, contained large numbers of bird bones including domestic fowl and pheasants. A pit (134059) some distance south-east of the lodge contained frequent fallow deer bones, possibly representing the disposal of waste from an episode of poaching. Roe deer and red deer bones were recovered in smaller numbers from other features. Other species, including the usual domesticates, horse, dog, cat and fox bones were only present at low levels. Additional game being hunted included rabbit and goose (Bates).

Conclusions

The sequence of changes in the landscape at Stansted Airport was very similar to those on the A120 sites (Timby *et al*. 2007) to the east and on the 1986-91 excavations (Havis and Brooks 2004). Results from these studies have helped to fill in some of the gaps in the sequence, particularly where waterlogged preservation has provided several lines of evidence, such as in the Middle Bronze Age barrow ditch. Mineralised preservation in two Late Saxon and early medieval faecal deposits provided valuable additional information about the non-cereal aspect of the diet. The most notable differences in this area were the continued cultivation of hulled wheat into the early medieval period, and the bone and other environmental evidence from the Hunting lodge, providing information about a specific type of land management. The local clay soils were likely to have been the main controlling factor throughout the centuries on aspects such as industrial activities (due to the availability of fuel wood), the introduction of new crop plants and the methods of crop husbandry being practised. They appear to have been deliberately selected during the Romano-British period for large scale cultivation of spelt wheat.



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