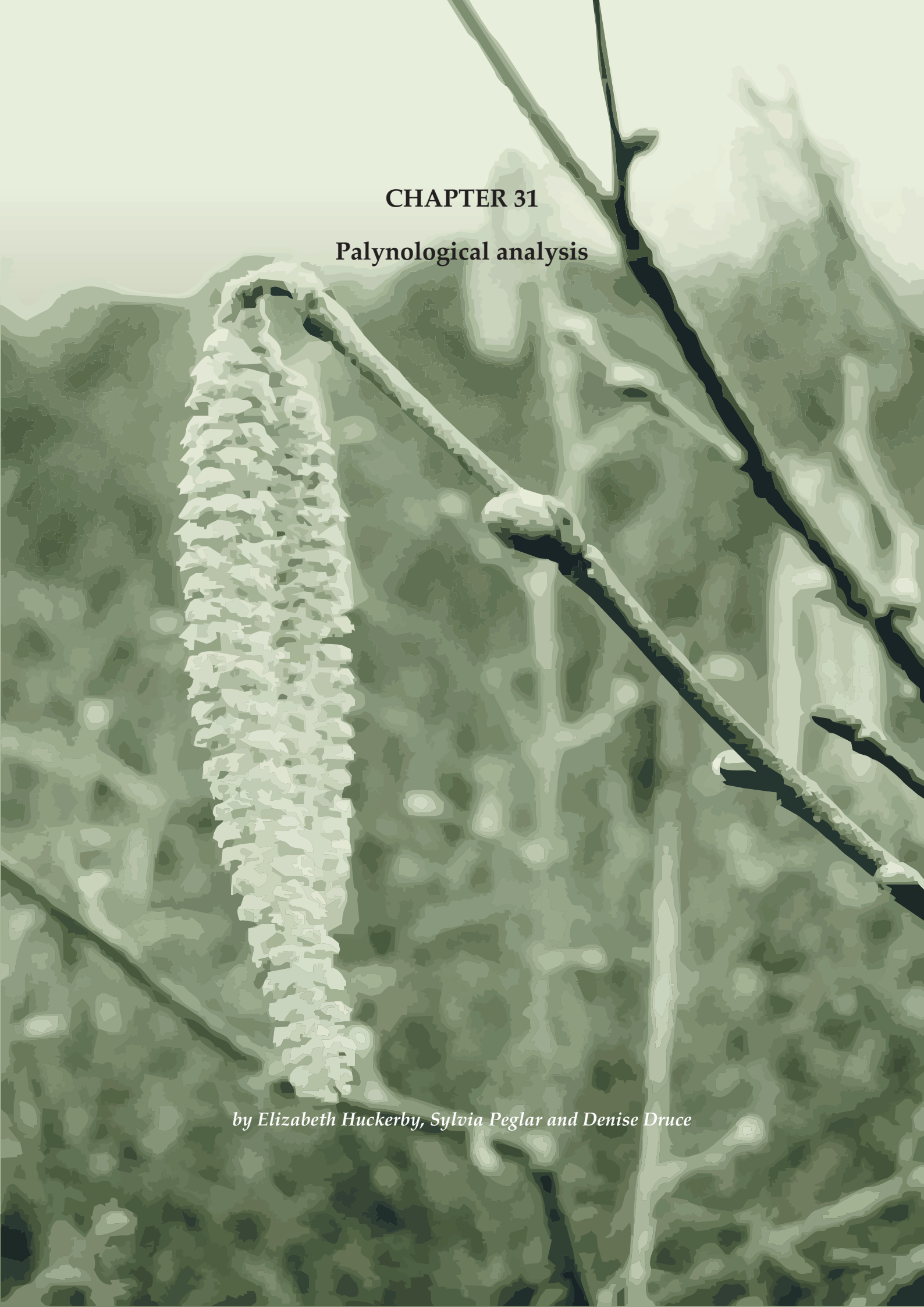


CHAPTER 31

Palynological analysis

by Elizabeth Huckerby, Sylvia Peglar and Denise Druce

31 Palynological analysis

Elizabeth Huckerby, Sylvia Peglar and Denise Druce

An intensive programme of sampling was undertaken during excavation to retrieve monolith samples for palynological analysis. Deposits dating from the middle Bronze Age to the post medieval were sampled from a number of different feature types including the ditch of a round barrow, waterholes, pits and boundary ditches. The only natural deposits identified during the excavations were those from the fills of the palaeochannel (327004): pollen was very sparse in these deposits and Patricia Wiltshire assessed them as having none or a very low potential for further analysis (site archive assessment report).

Thirty of these monolith samples, representative of the spatial distribution of the features, chronology and feature type, were selected for assessment. Twelve samples were selected for further analysis (Table 31.1). Six samples analysed were from Middle Bronze Age features, two from a 2nd-3rd century AD ditch and single samples from a late Romano-British pit, a late Romano-British enclosure ditch, a late medieval waterhole and a post-medieval pit.

Pollen analysis of the samples was problematic and lengthy because preservation was poor throughout the features and often pollen frequencies were very low. The paucity of the pollen record is in part a result of the highly calcareous nature of the tills together with the low number of waterlogged fills, which are not conducive to the preservation of pollen and other palynomorphs. Patricia Wiltshire, in her assessment report, considered that the sparse nature of the pollen record was also partly the result of periodic wetting and drying of the sediments as the water-table fluctuated. Pollen and other palynomorphs are best preserved in acidic, anaerobic, and permanently waterlogged conditions, for example mires/peat bogs. However, further analysis of the samples was judged to be a priority to provide a dataset, albeit a limited one, of the vegetation within the environs of the Stansted settlements.

The earlier assessments demonstrated that the basal fills from the majority of the features often included high frequencies of pollen and spores from either pre-Quaternary or pre-Devensian deposits. In fact some of the upper fills exhibited a similar feature which was interpreted by the excavators as either slippage from the sides or deliberate back-filling of the features, and this was confirmed by the palynomorph assemblages.

Methods

Subsamples of a standard size (1ml in volume) were prepared for pollen analysis using the standard techniques of sodium or potassium hydroxide, acetolysis and either hot hydrofluoric acid or zinc chloride treatment (Faegri and Iversen 1989). Tablets of *Lycopodium* spores were added at the start of the preparation so that pollen concentration values could be calculated if required (Stockmarr 1971). The residues were mounted in

silicone oil and examined with a high powered binocular microscope using x400 magnification routinely and x1000 for critical grains. The size of the pollen sum was variable because of the sparse nature of the assemblages in most samples. Pollen identification was carried out using the standard keys of Faegri and Iversen (1989), Moore *et al.* (1991), and limited reference collections held at Oxford Archaeology North and by Sylvia Peglar. Cereal-type grains were defined using the criteria of Andersen (1979); indeterminate grains were recorded using groups based on those of Birks (1973). Charcoal particles >5µm were also recorded following the procedures of Peglar (1993). Plant nomenclature follows Stace (1991).

Analysis of data

Analysis and storage of the data was accomplished using the TILIA and TILIA-Graph software package (Grimm 1990), to categorise data and aid its interpretation. Pollen count sheets, microscope slides, and the residues of prepared samples are stored at Oxford Archaeology North.

Presentation of results

Pollen data has been presented as percentage diagrams using the computer programs TILIA and TILIA-GRAPH (Grimm 1990). The percentage values are based on a pollen sum of all land pollen and fern spores but excludes aquatic taxa and indeterminate grains. All palynomorphs excluded from the pollen sum are expressed as a percentage of the pollen sum plus the group sum in which they belong, and charcoal values are expressed as a percentage of the pollen sum plus the charcoal counts. The diagrams have not been divided into pollen zones as it was thought to be more informative when the pollen data was related to the actual contexts.

Results

Middle Bronze Age

Barrow 324078 (MTCP) (Figs 31.1-31.2)

Undoubtedly one of the most important features from the excavation was that of the round barrow with its surrounding ditch. The complex sequence of fills from this ditch included a highly organic layer described as a peat in the field. Sample 2667 was taken through the fills on the drier side of the barrow away from the watercourse, whereas sample 2719/2720 was taken through the lower fills of the ditch on the opposite side where it is likely that the proximity of the watercourse resulted in a higher water table and hence more waterlogged conditions while the feature was extant and as it fell into disuse.

Sample 2719/2720 (Fig. 31.1)
There was insufficient pollen from SG 324070 (the "peat" like layer, context 320135) except at the lower boundary with SG 324074 (context 320134) and 324076 (context

320133), that is the fills above and below SG 324074 (context 320134), to give viable pollen counts. Dinoflagellate cysts and spruce (*Picea*) grains together with large numbers of poorly preserved pollen were recorded in both these layers suggesting that there was some reworking of earlier sediments into these fills. However, pollen was abundant and well preserved in SG 324074 (context 320134), which is immediately beneath the "peat" like layer. The summary pollen diagram (see Fig. 31.2) shows that tree and shrub pollen was less than 20% in this fill and fell to 5%, with alder and hazel (*Alnus glutinosa* and *Corylus avellana*) pollen recorded in the greater numbers but with other tree and shrub taxa recorded more sporadically suggesting areas of scrubby woodland but with no substantial tree cover. Tree and shrub pollen rises to its highest values at 0.38 m from the top of the sample (2719/2720) when it is associated with a peak in bracken and fern spores.

Cereal pollen was recorded in all but two of the subsamples in which sufficient pollen was preserved to give a valid pollen sum. The size of the pollen grains and the diameter of the annulae, which are used as criteria in the identification of grass and cereal pollen (Andersen 1981), are such that these cereal-type pollen grains can confidently be identified as being from cereals and not from wild grasses such as Sweet grasses (*Glyceria)*. This suggests that there may have been some cereal cultivation in close proximity to the barrow. Cereal pollen is poorly dispersed, and research in Northern Germany has shown that very little pollen is preserved in the pollen record within 1700 metres of a known medieval field system, and that by a distance of 3 kilometres it is under-represented (Behre and Kŭcan 1986).

The presence of cereal pollen in the fills SG 324074 (context 320134), SG 324070 (320135) and SG 324067 (3200137) from the side of the ditch nearest to the water course, contrasts with the insect fauna analysis in which very few beetles characteristic of arable or disturbed ground were recorded (see Robinson, CD Chapter 36). However, the pollen data suggest that although some cereal cultivation was taking place when the lower fills of the round barrow ditch were accumulating in the Middle Bronze Age, grassland or open ground dominated the landscape with occasional stands of alder and hazel. The records of goosefoot family (Chenopodiaceae), mugwort (*Artemisia*) and greater/hoary plantain (*Plantago major/media*) pollen are also indicative of arable cultivation or open disturbed ground. However, the relatively high percentages of grass (Poaceae) and ribwort plantain (*Plantago lanceolata*) pollen suggest that grassland predominated with some waste ground and arable cultivation. Furthermore, open grassland taxa were rare in the waterlogged plant remains and no ribwort plantain (*Plantago lanceolata)* seeds were recorded (see Carruthers, CD Chapter 34) although both the pollen and insect remains records suggest that it was present (see Robinson and Carruthers, CD Chapters 36 and 34). Carruthers suggests that this may be due to heavy grazing preventing the plants from setting seed. The increasing values of pollen from pondweed (*Potamogeton*), sedges (Cyperaceae), meadowsweet (*Filipendula*) and bulrush/bur-reed (*Typha angustifolia*/*Sparganium*-type) complement the evidence from the waterlogged plant remains (see Carruthers, CD Chapter 34) of an aquatic or marginal community around the feature. However meadowsweet grows in both wet and dry places.

Sample 2667 (Fig. 31.2)
Pollen was less abundant and more poorly preserved in the second sequence (sample 2667) taken through the ditch fills on the drier side of the barrow away from the water course. There was insufficient pollen in SG 324067 (context 316134) and in the lower part of SG 324075 (context 316132) to reach a statistically valid pollen sum. However pollen was recorded in sufficient numbers in the upper part of SG 324075 (context 316132), likely to be contemporaneous with SG 324074 (context 320134) of sample 2719/2720 (Fraser Brown pers. comm.) and in SG 354070 (context 316133) in what was described as the "peat deposit". This more polliniferous section of the sequence is in marked contrast to sample 2719/2720 where little or no pollen was recorded in what was described as the "peat deposit".

The upper three samples in the pollen diagram from sample 2667 represents the pollen record from the ditch fills, which accumulated above those in sample 2719/2720 discussed above. The values of tree and shrub pollen (see summary pollen diagram Fig. 31.1) are considerably higher than from the opposite side of the ring ditch with a minimum of 25% total land pollen and spores and a maximum of 60%. High values of lime (*Tilia*) and indeterminate pollen grains (more than 50%) were recorded at depths of 0.30, 0.32, 0.44 and 0.46m (not shown in the diagram) from the top of the samples, which together with the records of spruce (*Picea*), high numbers of indeterminate spores and the presence of dinoflagellate cysts in some of the depths analysed suggest that the lower part of SG 324075 (context 316132) and the upper part of SG 324070 (context 316133) are disturbed and include palynomorphs from older deposits that predate the barrow. Taxa that are more resistant to degradation and crumpling, or are so distinctive that they can be identified even when preservation is poor, for example, alder (*Alnus*), lime (*Tilia*) and dandelion-type (*Taraxacum*-type), are also well represented in all the samples, suggesting a skewed dataset as a result of differential preservation as the feature became drier and less anaerobic inhibiting the preservation of less resistant pollen types. However the higher percentages of arboreal pollen in this sample may be indicative of the regeneration of woodland/scrub around the barrow and Carruthers (CD Chapter 34) also records the remains of woodland plants in the macrofossil record. Scaife (1988) notes that at Mar Dyke, along the Crags By-pass, lime (*Tilia*) and oak (*Quercus*) woodlands remained well into the Iron Age in South East Essex and the Lower Thames Region The results of these analyses from sample 2667 support the assessment by Patricia Wiltshire of this sample, although there are some differences, probably reflecting the extreme variability in the quality of the pollen record.

The inclusion of reworked material and the nature of the pollen record suggest that perhaps little credence should be placed on the analysis of the pollen sequence recorded in sample 2667.

The complex nature of the depositional sequence of the barrow ditch and the validity in the pollen record between and within the samples has made the interpretation of the pollen data extremely difficult. The authors have attempted to relate the two samples (2667 and 2719/2720). A picture is emerging that the barrow may have been constructed in an essentially cleared grassland landscape with some stands of woodland and areas of

cultivation. The ditch itself remained wet and was possibly bordered by wet grassland with sedges and meadowsweet. If the pollen record (sample 2667) from the drier side of the ditch is more recent than that from the side nearer the watercourse, it suggests that, as the barrow fell into disuse, the landscape became more wooded again although some areas of waste ground probably remained.

Pit 316118 (MTCP)

Sample 2705/2706 (Fig. 31.3)
Sample 2706 was from a Middle Bronze Age pit 316118 close to the round barrow (324078). The sample was taken through the fills and into the natural deposit in which the feature had been cut. The feature is described as a waterhole. The fills were interpreted in the field as following the same depositional sequence as those from the ring ditch of the round barrow. Nine subsamples were taken from 316114, 316116, 316117 and 316118 but only four of these, three from the primary fill (316117) and one from near the top of fill 316116, contained significant numbers of pollen grains. Fill 316116 was described in the field as a "peat" deposit and in the laboratory it was thought to be a very organic deposit. This more organic fill 316115 is shown on the section plans as domed. Pollen was sparse in the lower part of this context (although described in the field and laboratory as highly organic) and in the natural (316118). However significant numbers of well preserved grains were recorded in the upper part of fill 316116 (at a depth of 0.10m from the top of the sample), this fill (316116) thought to have been laid in water and fill 316117, which appears to have accumulated rapidly at the base of the feature.

The summary pollen diagram shown in Figure 31.3 shows that tree and shrub pollen was recorded at low values in the lower part of fill 316117 (at depths of 0.42 and 0.37 m from the top of sample 2705/2706), but rose slightly towards the top of the primary fill (at a depth of 0.32 m). Grass and ribwort plantain (*Plantago lanceolata*) pollen were the major components of the pollen assemblage with other taxa indicative of grassland and open ground also recorded: for example, fairy flax (*Linum catharticum*), cowslip (*Primula veris*-type), buttercup (*Ranunculus*) and dandelion-type. Cereal-type pollen, with the characteristics of size and annulus diameter (Anderson 1981) was also identified suggesting some possible cereal cultivation. Bracken and undifferentiated fern spores were quite frequent.

No obligate aquatic taxa, except the colonial alga *Botryococcus*, were recorded, but taxa, which may grow on wet ground such as sedges (Cyperaceae), water mint (*Mentha*-type) and meadowsweet (*Filipendula)* were present although not abundant.

The pollen record from the primary fill (basal three levels) suggests that grassland or open ground dominated the landscape around the feature with some cereal cultivation when the fills were accumulating in the Middle Bronze Age. There is some evidence of wet ground in the area but, as no pollen from obligate aquatics was recorded, it suggests that if indeed the pit was water filled, there was no floating vegetation. The increase in the pollen of alder, field maple (*Acer campestre*-type) and hazel towards the top of the fill

suggests that there may have been some increase in hedgerows, although this is unlikely as no grains of Rosaceae pollen other than a single hawthorn (*Crataegus)* grain was recorded, or scrub/areas of woodland. There is an increase in the number of indeterminate grains at this level. The preservation of pollen was good in the primary fill although the number of different taxa recorded is limited, but it does not appear to represent a pollen flora that has been differentially preserved but rather an impoverished plant community of open ground with dandelions, bracken and ferns with some hazel copses/scrub. Charcoal particles were abundant throughout.

The pollen spectrum from the single sample (0.10 m depth) in the organic fill (316116) in which there was a statistically viable pollen sum is significantly different from those in the primary fill (316117). The pollen assemblage suggests that, although the proportion of woodland remained similar, the more open ground probably became more impoverished with bracken and dandelions dominating. These changes may be indicative of a decline in cultivation and grazing resulting from the abandonment of the immediate area. Although the high values of bracken and dandelions could be indicative of differential preservation of the palynomorphs and thus a skewed data set, it is unlikely in this instance as the pollen and spores were well preserved.

The sparsity of pollen in this highly organic deposit (316116) is unexpected, although in the ring ditch, where a layer described as "peat" is thought to have been laid down under similar circumstances to this layer in pit 316118, pollen frequency was also very low. Whether the conditions in the feature were unfavourable for pollen preservation, or some other factor was responsible for this absence of pollen, is unknown. However, pollen grains are better preserved in acidic rather than alkaline conditions and the alkaline nature of the tills may have governed the alkalinity of the water. Alternatively, conditions may also have been aerobic, again inhibiting pollen preservation, although this seems unlikely as the organic matrix of the deposit would also not have survived. Thirdly the organic material may have been deliberately placed in the barrow ring ditch, and this material may only have contained low numbers of pollen grains. If this third hypothesis is correct, it may help to explain why the "peat" was not a uniform layer all round the ring ditch of the barrow, although the greater proximity of the Stansted Brook on the one side is thought to have influenced this. The domed nature of this similar organic layer in the feature, with more minerogenic sediments towards the edges of the pit, suggests to the authors that it was deliberately placed in the feature.

Waterhole 426015 (M11)

Sample 6171 (Fig. 31.4)
A pollen sequence (sample 6171) through the fills (426005 and 426004) of a Middle Bronze Age waterhole 426015 was analysed. Six subsamples were analysed from this feature. The pollen frequency was patchy with only sufficient numbers of pollen grains to give a statistically valid pollen sum in the lower parts of both fills, but absent from the top of fill 426005. Pollen preservation was variable but this did not preclude a viable pollen sum being reached.

The summary pollen diagram (Fig. 31.4) shows that the values of tree and shrub pollen were less than 10% of the sum of terrestrial pollen and spores, and herbaceous pollen dominated the assemblages. The pollen assemblages from the basal two samples of fill 426005, when the deposits of the waterhole started to accumulate, suggest a cleared landscape with open ground around the feature, with grasses, ribwort plantain, the greater/hoary plantains (*Plantago major/media*) and buttercups (*Ranunculus acris*-type) the most abundant pollen types. Cereal-type pollen was recorded and grains provisionally identified as cf wheat (*Triticum*-type) were recorded in the lower fill of the feature together with arable weeds, for example, goosefoots (Chenopodiaceae), stitchwort/chickweed family (Caryophyllaceae), mustard-type (*Sinapis*-type) and chamomile/yarrow-type (*Anthemis*-type), and suggest some arable cultivation in the Middle Bronze Age. In subsample 0.44 m, grass pollen increases at this time, but there is a reduction in the values of ribwort and other plantains. The lower part of fill 426004 (0.47 m depth) saw a substantial reduction in grass pollen with a concomitant increase in pollen from buttercups, ribwort and other plantains, nettles (*Urtica*) and trilete spores. It is possible this is indicative of the ground becoming more open with less grassland, although grass appears to recover at 0.24 m. Pollen preservation is worse at this time with many more indeterminable and dandelion-type grains recorded, together with an increase in fern spores, suggesting that conditions were less favourable for pollen preservation. Although the feature is described as a waterhole, obligate aquatics were only recorded sporadically except at the base of fill 426004 when large numbers of the colonial alga, *Botrycoccus*, were recorded. Similarly, plants associated with wet ground such as sedges and meadowsweet are infrequent but an increase in the representation of nettle pollen together with a peak in *Botrycoccus* suggests that nettles were growing on the damp banks, and is perhaps related to increasing nitrogen levels where animals may have come down to drink and defaecated. Charcoal particles were abundant throughout the profile.

The sporadic nature of the pollen record at some levels may have been caused by changes in the waterhole. Seasonal variations in the water levels may have inhibited pollen preservation when conditions were drier. Alternatively, the water quality may have fluctuated with increasing alkalinity, again inhibiting pollen preservation. Finally the sporadic nature of the pollen record may be indicative of deliberate backfilling of the feature.

Pit 408013 (FLB)

Sample 5019 (Fig. 31.5)
Eight subsamples were analysed, six from the primary fill 408016 and two from fill 408015. The summary pollen diagram in Figure 31.5 shows relatively low values of tree and shrub pollen, less than 25%, throughout the sequence, suggesting that the landscape was predominantly cleared of woodland when the fills of pit 408013 started to accumulate in the Middle Bronze Age. Minor fluctuations are recorded in the relative frequencies of pollen from trees and shrubs, herbs, and fern spores, with slightly higher values of tree pollen recorded in fill 408015, but even these are not indicative of any substantial woodland presence at Stansted. There was possibly some open/pasture woodland or copses with oak (*Quercus*), hazel (*Corylus*-type) and alder (*Alnus*).

Some cereal-type pollen was recorded in the sequence and both *Triticum* and *Hordeum* - type were recorded suggesting that some cultivation was taking place near pit 408013 in the Middle Bronze Age. Pollen from arable weeds and open ground taxa were also recorded, for example, *Anthemis*-type, which includes taxa such as chamomile (*Matricaria*) and corn marigold (*Chrysanthemum segetum*), and goosefoots (Chenopodiaceae).

The pollen assemblage is dominated by grasses (Poaceae), dandelion-type (Lactucoideae-type in the Asteracea), daisy-type (*Aster*-type in Asteraceae), ribwort plantain (*Plantago lanceolata*) and bracken (*Pteridium*). This assemblage is indicative of grassland, pasture and open ground plant communities in the Middle Bronze Age. Bracken may be growing in the grassland as the result of grazing or within the stands of woodland. The presence of sedge (Cyperaceae) pollen suggests that there were some areas of damp ground around this pit.

Pollen and spores were poorly preserved with many crumpled and degraded grains indicating a dataset skewed in favour of taxa with more resistant or easily identifiable pollen, for example, dandelion-type (Asteraceae (Lactucoideae)), goosefoot (Chenopodiaceae) and daisy-type (*Aster*-type).

Waterhole 302043 (MTCP)

Sample 2010/3
Samples from this context had been assessed earlier and found to have sparse but enough Holocene pollen to warrant further analyses. Eight samples were prepared and assessed by Denise Druce at OA North and no Holocene pollen was found in them. Two samples were then submitted to Sylvia Peglar, who re-prepared them for pollen analysis. No Holocene pollen was found in either of the re-prepared samples, but both had abundant pre-Quaternary pollen and spore types and acid-resistant dinoflagellate cysts. Such assemblages suggest that the samples submitted were derived from the boulder clay on which Stansted lies, and do not represent the Middle Bronze Age period

Romano-British

2nd-3rd century AD ditch 205018 (LBR)

Sample 4001/4002 (Fig. 31.6)
Three fills were recorded in this ditch and two monolith samples (4001 and 4002) were taken through two of these (202003 and 202002). Sample 4002 from the side of the ditch towards the edge of the feature was taken through the primary fill (202002) and the natural till. Sample 4001 was situated more centrally and cut through 202002 and 202003.

Three subsamples were analysed from sample 4002 (not illustrated) but only one sample at a depth of 0.12m from the top of the sample contained significant numbers of pollen grains associated with a high percentage of indeterminate pollen grains. Tree and shrub

pollen was low (8%) but included rare grains of hornbeam (*Carpinus*) and field maple (*Acer campestre*). Grass (Poaceae) pollen was the major herbaceous pollen type recorded but there were high values of cereal-type pollen (8%) indicating that cereal cultivation was taking place nearby. However arable weeds were not well represented with the exception of goosefoot (Chenopodiceae) and mustard-type (*Sinapis*) pollen. Pollen from other taxa are from plants that can grow either in grassland or on open ground. The presence of high values of cereal-type pollen in archaeological features can become incorporated in the fills when they are released from the ears of corn during processing (Robinson and Hubbard 1977).

Six subsamples were analysed from sample 4001, which was placed more centrally in the ditch, and all but one (at a depth of 0.13m from the top of the sample) provided sufficient pollen to give a viable count. Pollen from the feature was, in general, poorly preserved. The summary diagram (Fig. 31.6) shows that tree and shrub pollen was not abundant although 15% of ash (*Fraxinus*-type) pollen was recorded in fill 202003 (at a depth of 0.23 m from the top of the sample) but this identification is somewhat uncertain due to the poor level of preservation of the pollen and the presence of high numbers of grains of bulrush/bur-reed (*Typha angustifolia*/*Sparganium*-type) pollen with which pollen of *Fraxinus* could be confused when badly preserved, and should perhaps be disregarded because of the uncertain identification. However, sporadic grains of field maple (*Acer campsetre*), aspen (*Populus*), hornbeam and sloe/cherry (*Prunus*) pollen were identified throughout the pollinifereous levels of the sequence from the fills of the ditch.

Cereal-type pollen was recorded in all the subsamples although the values were lower towards the edge in sample 4002. Evidence of cereal cultivation was further supported by pollen of arable weeds such as goosefoots, black bindweed (*Fallopia convolvulus*), knotgrass (*Polygonum aviculare*) and corn spurrey (*Spergula*-type).

High values of grass pollen, and a similar assemblage of herbaceous taxa as in the fills of the Late Romano-British enclosure ditch 143007 (sample 359, see below), are indicative of widespread pasture and grassland.

This ditch (205018) contained standing water with pollen from obligate aquatics such as duckweed (*Lemna*), and pondweed (*Potamogeton*) recorded. In the shallower water towards the ditch sides and on the banks bulrushes and/or bur-reeds were very frequent. The occurrence of occasional grains of spruce (*Picea*) pollen throughout the sequence suggests that there was some erosion of the ditch sides.

Late Romano-British pit 347041 (MTCP)

Sample 2517 (Fig. 31.7)
Sample 2517 was taken through the fills of the Romano-British pit 347041, which was described in the field as containing cess. Richard Macphail (pers. comm.) suggests that this is likely. Seven subsamples were analysed from this feature. As in other samples, pollen preservation was sporadic perhaps reflecting seasonal drying out of the feature,

increased alkalinity, or aeration inhibiting pollen preservation. Charcoal particles were exceptionally abundant preventing any accurate recording.

The summary pollen diagram shown in Figure 31.7 illustrates that tree and shrub pollen was only recorded in low numbers, although between 0.27 m and 0.54 m there was a diverse assemblage of tree and shrub pollen including hazel, oak, ash, field maple and beech (*Fagus*) associated with charcoal from all these taxa except *Fagus* (see Gale, CD Section 35l). Carruthers (CD Chapter 34) recorded very large numbers of charred spelt/emmer cereal grains with considerable quantities of crop processing waste which she interpreted as deliberate dumping. Richard Macphail (pers. comm.) and Gale (CD Chapter 35) describe this layer as containing abundant fine and coarse fragments of charcoal, possibly put into the pit to absorb the smells of the cess.

Cereal-type pollen, including wheat (*Triticum*) was recorded throughout the sequence and was at its highest values towards the base of fills 347044 and 347050. It was recorded with some pollen from arable weeds, for example, cornflower (*Centaurea cyanus*), chamomile, goosefoots, knotweed, mustards and plantain (*Plantago major/media*). Only a single grain of *Vicia* (vetches, peas and beans) pollen was recorded at the base suggesting that beans and peas were not being cultivated. A single grain of *Vitis* (grape) pollen was identified from the fill of 347050, but Carruthers (*ibid*) did not record any exotic food taxa in the plant macrofossils.

The pollen assemblage in this sample is similar to that in sample 359, from the late Romano-British enclosure ditch 143007 (see below) with grassland and open ground taxa recorded. However, there is one very striking difference to that from the enclosure ditch (143007) and that is the very high numbers of Apiaceae pollen in the fills 347048 and 347046 (layer 2 Macphail), thought to have accumulated when the feature was being used as a cess pit. Indeterminate Apiaceae pollen is a group of taxa which includes, among others, fennel (*Foeniculum)*, carrot (*Daucus*), hare's ear (*Bunium*), pignut (*Conopodium*), ground elder (*Aegopodium*) and burnt saxifrages (*Pimpinella*). Unfortunately it is difficult to distinguish the taxa in this broad pollen type. Such high values of Apiaceae pollen are very unusual and perhaps suggest that either the flowering plants were deliberately placed in the pit when the pit was indeed used as a cess pit or perhaps open ground surrounded the feature and was covered by plants such as cow parsley (*Anthriscus sylvestris*) or ground elder. The Apiaceae family is large and diverse and includes a number of plants that are known for their culinary uses, for example, coriander, fennel and parsley, or cultivated as vegetables such as carrots and parsnips. It also includes hemlock (*Conium maculatum*) used as a poison and medicinal plant by the Greeks and the Romans (Grieve 1982, 392). The primary fill (347044) (layer 3 Richard Macphail) and fills 347046, 347045 and 347050 were described in the laboratory as one layer (layer 2) by Richard Macphail and staff at OA North. Pollen from damp ground plants such as sedges, meadowsweet and common reed (*Phragmites*) was recorded but only in low numbers.

Spruce and pine pollen, pre-Quaternary spores and dinoflagellate cysts were recorded in the basal pollen sample, suggesting some slumping of the sides of the feature had taken

place. Poorly preserved pollen and indeterminate pollen rose to 80% towards the top of the sequence in the secondary fill (347048), which Richard Macphail (pers. comm.) describes as a typical chalk soil/sediment pit fill with some yellowish staining possibly influenced by a high water table. The pollen assemblage from this fill is dominated by dandelion-type, grass, Apiaceae and ribwort plantain. Pollen preservation was poor and the taxa recorded suggest that only those types that are very resistant to decay and are easily identified have been preserved.

Late Romano-British enclosure ditch 143007 (LTCP)

Sample 359 (Fig. 31.8)
Eight samples were prepared from sample 359, a single sample from context 152007, at a depth of 0.50 m, and the other 7 from context 152008. All samples contained sparse but countable pollen and spores, although they were generally not very well-preserved, sometimes limiting their specific identification. The results are shown as percentages of total terrestrial pollen and spores (Fig. 31.8). The percentages of indeterminables were quite high averaging 10% of the total terrestrial pollen plus spores and indeterminables. The summary diagram on the left of Figure 31.8 shows that the sequence of samples is dominated by herbaceous pollen types, particularly grasses (Poaceae undiff.) with very low percentages of tree and shrub pollen, and fern (Pteropsida) spores, suggesting that there was very little woodland in the catchment at the time of deposition, with a very open local environment recorded. All samples contain high amounts of microscopic charcoal particles (> 5 microns), and large particles (> 170 microns) were observed in the material sieved off during pollen preparation, indicative of local fires. These could be natural fires in the vicinity, but, given the herb-dominated assemblages and lack of tree and shrub pollen, suggest that these are local man-made fires.

Cereal pollen types, including barley (*Hordeum*-type) and wheat and/or oats (*Avena/Triticum*-type), are present throughout the feature together with the pollen of many herb types indicative of arable fields, including goosefoot family (Chenopodiaceae), cornflower (*Centaurea cyanus*), *Anthemis*-type possibly representing chamomile (*Anthemis*), corn marigold (*Chrysanthemum segetum*), and/or mayweeds (*Matricaria*), shepherd's purse-type (*Capsella*-type), mustard-type (*Sinapis*-type), mouse-ears and chickweeds (*Cerastium*-type), plantains (*Plantago major/P.media*), knotgrasses (*Polygonum aviculare*-type), bedstraws and field madder (Rubiaceae), docks (*Rumex crispus*-type), and speedwells (*Veronica*-type). Although no plant remains were analysed from this context, analysis of other late Romano-British contexts (Carruthers, CD Chapter 34) showed that emmer and spelt (*Triticum dicoccum* and *T.* spelta) were the dominant cereals being grown around Stansted at this time. The higher pollen values of barley-type (*Hordeum*-type) may include some pollen grains of wild species including sweetgrasses (*Glyceria*), telmatic species growing in shallow water or mud. They are characterized by having large pore annuli and small overall grain size compared with other taxa in the *Hordeum*-type, but the condition of the grains in these samples did not allow further investigation. There is little evidence of any leguminous crops. A couple of vetch (*Vicia*-type) pollen grains were present, but, based on size and pattern, are probably of weed species rather than cultivated types such as peas (*Pisum*) or beans *(Vicia*).

The high grass pollen values (Poaceae undiff.), together with many herb pollen taxa such as oxeye daisy (*Leucanthemum*) and yarrow (*Achillea*) both within the *Anthemis*-type, daisies (*Bellis)* and ragworts (*Senecio*) within *Aster*-type, knapweed (*Centaurea nigra),* thistles (*Cirsium*), Asteraceae (Lactucoideae) including dandelions (*Taraxacum*) and hawkweeds (*Hieracium*), bird's-foot trefoil (*Lotus*), clovers and medicks (*Trifoium/Medicago*), ribwort plantain (*Plantago lanceolata*), cinquefoils (*Potentilla*-type), buttercups (*Ranunculus acris*-type), bedstraws (Rubiaceae), sorrels (*Rumex acetosa*-type), and speedwells (*Veronica*-type), are indicative of widespread grassland and pastures. Bracken (*Pteridium*) may have grown in the grassland, either as a remnant of the former forest, or as a result of grazing.

Many other herbaceous pollen types found are characteristic of waste ground and waysides, eg mugwort (*Artemisia*), ragworts (*Senecio* within *Aster*-type), thistles (*Cirsium*), many taxa within Asteraceae (Lactucoideae), *Capsella*-type and *Sinapis*-type, mouse-ears and chickweeds (*Cerastium*-type), goosefoots (Chenopodiaceae), bird's-foot trefoil (*Lotus*), clovers and medicks (*Trifolium/Medicago*), docks (*Rumex crispus*-type), and nettles (*Urtica*), suggesting that there was quite a lot of waste and bare rough ground around the site.

The little tree and shrub pollen that is present is mainly of oak (*Quercus*), ash (*Fraxinus*), and hazel (*Corylus*). Other taxa include maple (*Acer*), willow (*Salix*), poplar (*Populus*), dogwood (*Cornus sanguinea*), hawthorn (*Crataegus*-type), brambles (*Rubus fruticosus*-type), and Rosaceae-type which may include blackthorn (*Prunus spinosa*) and other rosaceous shrubs. Such a pollen assemblage could be indicative of local hedgerows, or scrub.

The presence of pollen of obligate aquatic taxa suggests that there was standing water in the ditch – duckweed (*Lemna*), pondweed (*Potamogeton*), and aquatic buttercups (*Ranunculus trichophyllus*-type) floating on the water, and telmatic plants such as water plantain (*Alisma*-type), bulrushes and/or bur-reed (*Typha angustifolia*-type) growing in the shallow water and mud around the edges. Other taxa, such as sedges (Cyperaceae), meadowsweet (*Filipendula*), and umbellifers (including marshworts (*Apium*-type)), are indicative of damp grassland and were probably growing around the ditch.

The presence of pre-Quaternary pollen and spores in the basal samples, probably derived from the boulder clay, suggests some erosion of the sides of the ditch.

These analyses therefore suggest a very open environment around the site during late Romano-British times, most of the forest having been cleared. Fields were present in which cereals were being grown, possibly surrounded by hedgerows, but with extensive areas of meadows and grazed grassland, and areas of bare rough ground.

The report on the soils (Macphail and Crowther, CD Chapter 30), suggests that (at least in context 152007) the samples reflect animal management rather than mixed farming, with some small-scale industrial activity on the site with the use of corn driers (some

burnt soil was found in context 152007). The pollen results concur with these conclusions, and with those of earlier pollen assessments.

Late medieval
Waterhole 134059 (LTCP)

Sample 446 (Fig. 31.9)
Six samples were prepared and analysed from sample 446 through the fills of a probable waterhole 134059. The results are presented as percentages of the total terrestrial pollen and spores (Fig. 31.9).

The pollen was sparse and not very well preserved, particularly towards the top of the feature, indeterminables averaging 10% of total terrestrial pollen and indeterminables. At the base of the section, tree and shrub pollen is approximately equal to that of herb pollen, but in the upper half of the section total tree and shrub pollen values decrease and there is a concomitant increase in herb pollen and also in fern (Pteropsida) spores, particularly those of bracken (*Pteridium*). Tree and shrub pollen is mainly of oak (*Quercus*), maple (*Acer*) and, particularly towards the base, ash (*Fraxinus*) and hornbeam (*Carpinus*). This suggests that there was some woodland within the catchment, but, as trees generally produce much larger quantities of pollen than herbs, the high herb values here imply that the local environment must have been quite open throughout the time of deposition of these sediments. Towards the top of the section there is evidence for increased grassland with increases in the pollen of grasses (Poaceae) and other herb taxa associated with meadows and grazing, particularly Asteraceae (Lactucoideae) which can include dandelions (*Taraxacum*), hawkweeds (*Hieracium*), Hawk's-beards (*Crepis*) and Cat's-ears (*Hypochoeris*) among others. As the area seems to have been cleared during Romano-British times (see above), there may have been some secondary woodland development. However, the high grass (Poaceae) and oak (*Quercus*) pollen values suggest that the area may have been parkland, grassland within which large standard trees (particularly oaks) grew. There is also evidence for hedgerows, particularly in the basal samples, with the occurrence not only of oak, maple, ash, and hazel (*Corylus*), but also of dogwood (*Cornus*), hawthorn (*Crataegus*-type), holly (*Ilex*), poplar (*Populus*), and willow (*Salix*). Charcoal particle values are quite high throughout the section, evidencing local man-made fires.

Cereal pollen - barley (*Hordeum*-type) and oats (*Avena*) and/or wheat (*Triticum*) - attain quite high values at the base of the section together with weeds characteristic of arable fields, but decrease towards the top as grasses and taxa indicative of grasslands and grazing increase. It is interesting to note that not a single pollen grain of crops usually associated with medieval farming, such as rye (*Secale*), beans and peas (*Vicia/Pisum*), hemp (*Cannabis*) or flax (*Linum*) were identified, although Carruthers, in other medieval contexts at Stansted, had plant remains of rye, peas, and beans. Even if this area was unsuitable for growing these crops, their cultivation was widespread during medieval times, probably in river valleys, and odd wind-dispersed grains should have been encountered. The pollen assemblages found here are therefore not typical of medieval or post-medieval times.

The occurrence of the pollen of obligate aquatics (duckweed (*Lemna*), pondweed (*Potamogeton*) and aquatic buttercups (*Ranunculus trichophyllus*-type), and green algal spores of the family Zygnemataceae (*Mougeotia* and *Spirogyra*) throughout the section, is evidence of standing water within the feature, which was surrounded by damp muddy ground on which grew telmatic species of bulrushes and/or bur-reeds (*Sparganium erectum* and *Typha angustifolia*-type). Ascospores of the fungus *Chaetomium*, indicators of human impact in the past, were also found throughout the section.

This section therefore appears to show that the local environment was quite open with cereal cultivation, possibly with hedgerows, and perhaps parkland or some scrub at the base. Towards the top of the section, the grasslands or parklands appear to increase at the expense of the arable fields.

Post-medieval

Pit 464035 (LTCP)

Sample 908 (Fig. 31.10)
Four subsamples were analysed for pollen, two from fill 464039 and one each from 464040 and 464038. Fills 464040 and 464039 are thought to have accumulated after the feature went out of use and fill 464038 is thought to be post-medieval but possibly earlier and contemporary with the latest phase of the hunting lodge. The summary pollen diagram shows that low values of tree and shrub pollen were recorded throughout the sequence suggesting a landscape with occasional trees and sporadic grains of field maple, sloe/cherry and elder (*Sambucus*) suggesting that some hedgerows were present in the post-medieval period. The pollen assemblage is dominated by herbaceous taxa. Although grass and ribwort plantain are the major pollen taxa, the pollen spectra from the four samples record a large variety of different pollen types. Cereal pollen is present throughout, together with arable or cultivated ground weeds such as chamomile, goosefoots, bistort (*Persicaria bistorta*), redshank (*Persicaria maculosa*) and mustards. *Vicia*-type pollen was identified and may be associated with the growing of peas and beans.

The presence of pollen from pondweed, bulrush or bur-reed, *Apium*-type and meadowsweet in all the samples, suggests that the pit/ditch continued to hold some water with damp margins during the later phase after the lodge had gone out of use, and the fills were accumulating.

Discussion and conclusions

Regional background
The background vegetation of Stansted and north-west Essex is poorly recorded because of the paucity of suitable natural deposits. However a palaeochannel sequence from an earlier phase of excavation from 1986-1991 was studied by Patricia Wiltshire (Wiltshire

and Murphy 2004a). These deposits started forming in the Early Bronze Age 2560-2030 cal BC but there is no record from Stansted of the vegetation in the Mesolithic and Neolithic, although two pollen diagrams from a palaeochannel sequence near to the medieval farm at Stebbingford, Felsted to the east of Stansted (Murphy and Wiltshire 1996) and a peat deposit at Mar Dyke along the Grays By-pass, Essex, record the more regional vegetation of the Mesolithic. At Stansted, Wiltshire and Murphy (2004a) describe the vegetation in the Early Bronze Age, on the drier ground away from the palaeochannel, as a lime/oak and hazel (*Tilia*/*Quercus* and *Corylus*) woodland. The values of lime pollen recorded suggest that lime was probably the major component in this woodland with hazel and occasional scrubby oak trees. Lime produces low numbers of poorly dispersed pollen grains (Andersen 1970; 1973; Huntley and Birks 1983) and therefore values of up to 15% suggest that lime woods were growing quite close to the palaeochannel in the early Bronze Age. An alder fen carr probably grew on the wetter ground.

The presence of poorly preserved pollen grains higher up in the sequence led Wiltshire to suggest that an hiatus may have taken place in the deposition of the palaeochannel. Because of this and the lack of scientific dating she was unable to relate changes in the upper part of the pollen diagram to the archaeology, but she did suggest that a dark upper band in the sequence represented the Anglo-Saxon period.

Regionally a palaeochannel sequence was assessed for pollen sequence near to the medieval farm at Stebbingford, Felsted to the east of Stansted (Murphy and Wiltshire 1996) and the pollen assemblages from this very limited data suggest that the sequence started forming in the early Holocene, but with no absolute dating and the very low values of pollen in the deposits it is not possible to be certain. However the data do suggest an open landscape with some birch and pine and herbs of open ground, typical of the early Holocene or Late Devensian, which followed the retreat of the ice after the last glaciation (Pennington 1977). Murphy and Wiltshire (1996) interpreted the pollen data to suggest that most of the channel sequence accumulated in the Mesolithic and it is interesting to note that high frequencies of charcoal fragments were recorded throughout. Similar charcoal values have been recorded in other Mesolithic deposits.

A peat deposit at Mar Dyke, along the Grays By-pass, Essex, although not dated scientifically, is thought to have started forming when alder expanded. Scaife (1988) cites that this expansion has been dated to 6015-5676 cal BC (6970±90BP; Q1281) at Tilbury (Worlds End) Stone Marsh and at Broadness Marsh 5965-5606 cal BC (6822±90BP; Q1283). Scaife describes a woodland dominated by lime, oak and hazel in the Mesolithic and thought it likely that almost pure stands of lime were growing on the slightly higher, drier ground close to the Mar Dyke wetland around this date in the Mesolithic. A little before 3909-3374 cal BC (4850±90BP) Scaife *(*1988) recorded an elm decline associated with the first occurrence of cereal-type and ribwort plantain (*Plantago lanceolata*) pollen and he cites a similar date at Stone Marsh of 3968-3516 cal BC (4930±110BP; Q1336). At Mar Dyke, following this elm decline, secondary woodland developed and there is no further evidence of anthropogenic activity until c 1630BC in the early Bronze Age. After this date evidence of anthropogenic activity increases with a further reduction in elm

pollen and the appearance of beech (*Fagus*) and pine (*Pinus*) pollen. Pollen from the first taxon is poorly dispersed due to its large size and weight, suggesting that it was growing quite close by, whereas pine pollen is very widely dispersed and therefore probably the result of long distance transport. Scaife considers that birch (*Betula*) scrub recolonised the cleared areas and a woodland dominated by lime with some oak remained close to the site. Scaife (1988), interpreting his pollen data from Mars Dyke, considers that lime remained an important tree in the woodland into the Iron Age. The pollen from herbaceous plants, including cereal-type and ribwort plantain, continues to rise till c 400 AD when archaeologically there is a decline in cultivation.

The Middle Bronze Age

The pollen diagrams from the fills of the ring ditch of the round barrow 324078 (samples 2719/2720 and 2667), the pit 316118 (sample 2706) from near the barrow, the waterhole 426015 (sample 6171) from the middle of the settlement and the pit 408013 (sample 5019) provide us with some evidence as to the environment of the settlement in the Middle Bronze Age. The pollen data from these features suggest that there was no substantial tree cover in the environs of the settlement in contrast to the Early Bronze Age when a lime/oak and hazel (*Tilia*/*Quercus* and *Corylus*) woodland was growing on the drier ground, and alder carr (*Alnus*) on the wetter areas near the palaeochannel (Murphy and Wiltshire 2004a).

The pollen data from the Middle Bronze Age features studied suggest that arable cultivation was being practised close to the settlement. However, the pollen data also suggest that grassland and/or open ground was likely to have been frequent and supports the plant macrofossil and insect records for pasture and open ground (Carruthers, CD Chapter 34 and Robinson, CD Chapter 36). Rises in tree pollen recorded towards the top of the pollen samples suggest that there was some increase in small stands of scrub/woodland as arable cultivation declined and the features went out of use. This corroborates the plant macrofossil record (Carruthers, CD Chapter 34).

There are few sites with which to compare the Middle Bronze Age pollen records from Stansted, although Murphy and Wiltshire (1998, 173-81) analysed the fills from two archaeological features in the Blackwater Valley, North East of Stansted and South West of Chelmsford. The fills were from a Middle Bronze Age well at Chigborough Farm and a Late Bronze Age well/waterhole at Slough House Farm. As at Stansted, the ground around the well at Chigborough Farm was dominated by open weedy grassland and waste ground (Murphy and Wiltshire 1998, 178-81). The pollen evidence from this site suggests the growth of a little diverse woodland, with oak as the major taxon, but its proximity to the settlement is uncertain. Cereal pollen was recorded throughout the fills suggesting that, as at Stansted, there was arable cultivation nearby or there was extensive crop processing.

In the Late Bronze Age at Slough House Farm, in the Blackwater Valley, the pollen data from the lower fill of a waterhole/well suggested that the surrounding area was dominated by a weedy grazed grassland and cereals were being grown and/or processed

nearby (Murphy and Wiltshire, 1998, 173-178). Murphy and Wiltshire (1998, 178) thought that the waterhole/well contained rather stagnant water and was surrounded by wet, waterlogged soils. After abandonment, in the middle and upper sections of the pollen diagram oak pollen was well represented together with acorns and leaves, suggesting either the growth of oak trees nearby, or deliberate deposition of oak debris. Towards the top of the sequence there are possible indications of a renewed phase of clearance above this possible phase of woodland (Murphy and Wiltshire, 1998).

Romano-British

In the Romano-British period the fills from only three features were assessed as suitable for further analysis. These were a 2nd- to 3rd-century ditch 205018 (samples 4001/4002), a late Romano-British pit 347041 (sample 2517) and a late Romano-British enclosure ditch 143007 (sample 359). The pollen analyses from the Romano-British features at Stansted suggest a very open environment around Stansted during this time, most of the woodland having been cleared. Fields were present in which cereals were being grown, possibly surrounded by hedgerows, but with extensive areas of meadows and grazed grassland, and areas of bare rough ground.

The report on the soils from Stansted (Macphail and Crowther, CD Chapter 30), suggests that (at least in context 152007) the samples reflect animal management rather than mixed farming, with some small-scale industrial activity on the site with the use of corn driers (some burnt soil was found in context 152007). The pollen results concur with these conclusions, and with those of earlier pollen assessments by Wiltshire.

In the 2nd to 3rd century, analyses from a ditch on the LBR site suggest both arable and pastoral farming were being practised. There was no evidence of crops other than cereals being grown. The pollen evidence from a late Romano-British pit (347041) is likely to be a somewhat skewed dataset as it probably represents the pollen from plants either deliberately placed in the pit to prevent the odours associated with a cess pit or from rubbish disposal. It is perhaps interesting to note that although Carruthers (CD Chapter 34) identified no exotic plant macrofossils, although a single grain of grape pollen was recorded in pit 347041 (Fig. 31.7) suggesting that either grapes (fresh or dried) were being consumed or even grown at Stansted in the post-medieval period.

The unstable nature of the sides of all three Romano-British features is suggested by the presence in the basal samples of spruce and pine pollen, dinoflagellate cysts and Pre-Quaternary spores, probably derived from the surrounding boulder clay into which the features were dug. There are no comparably dated sites from the Blackwater Valley (Murphy and Wiltshire 1998) or the earlier phase of the Stansted excavations (Murphy and Wiltshire 1998) with which to compare the results of this phase of excavation.

Late medieval and post-medieval

During this phase of pollen analysis from Stansted only two features were assessed as being suitable for pollen analysis. They were the fills from a waterhole 134059 (sample

446) dated to the late medieval and those from a post-medieval ditch 464035 (sample 908).

The pollen data from the late medieval waterhole 134059 is enigmatic, with not a single pollen grain of crops usually associated with medieval farming, such as rye (*Secale*), beans and peas (*Vicia/Pisum*), hemp (*Cannabis*) or flax (*Linum*) being identified, although Carruthers, in other medieval contexts at Stansted, had plant remains of rye, peas, and beans. Even if this area was unsuitable for growing these crops, their cultivation was widespread during medieval times, and odd grains would have been expected in the analyses. Therefore the pollen assemblages found here are not typical of medieval or post-medieval times. The feature is well dated, however, by the articulated bones of a fallow deer, radiocarbon dated to 1330-1450 cal AD (497±30BP, NZA-23750). It is possible that the weight of the articulated bones may have caused it to sink into the somewhat 'sloppy' deposits suggesting that the deer may not be contemporary with the deposits. However it was the view of the excavator that the articulated deer and the waterhole are contemporary.

The pollen assemblages from this late medieval feature suggest that arable cultivation was important. Cereal pollen, barley (*Hordeum*-type) and oats (*Avena*) and/or wheat (*Triticum*), attain quite high values at the base of the section together with weeds characteristic of arable fields, but decrease towards the top as grasses and taxa indicative of grasslands and grazing increase. However, the high grass (Poaceae) and oak (*Quercus*) pollen values suggest that the area may have been parkland, grassland within which large standard trees (particularly oaks) grew. There is also evidence for hedgerows, particularly in the basal samples, with the occurrence not only of oak, maple, ash, and hazel (*Corylus*), but also of dogwood (*Cornus*), hawthorn (*Crataegus*-type), holly (*Ilex*), poplar (*Populus*), and willow (*Salix*). Charcoal particle values are quite high throughout the section, evidencing local man-made fires.

There are few medieval pollen studies from natural deposits or archaeological features in the Stansted region with which to compare this data except for a palynological assessment of cultivation plots, latrine and cess pit fills from the medieval farm at Stebbingford, Felsted to the east of Stansted (Murphy and Wiltshire 1996). There was no palynological evidence from the cultivation plots or the putative latrine but some from the possible cess pit. The pollen assemblage recorded from this latter feature suggests an open habitat, perhaps damp grassland (Murphy and Wiltshire 1996). Cereal-type pollen, an egg from a nematode worm (*Ascaris*), which parasitises large mammals and humans, and a single possible "grape" pollen grain were recorded in this feature at Stebbingford suggesting a "waterlogged" cess pit.

In the post-medieval the pollen diagram from the fills of pit 464035 (Fig. 31.10) suggests a landscape with occasional trees and some hedgerows, but the vegetation was largely one of open grassland with a little evidence for cereal cultivation. As in the late medieval feature there is no evidence for the growth of such crops as rye, hemp of peas/beans in this pit, which is associated with the later phases of the hunting lodge.

Conclusions

The problems associated with the interpretation of the pollen data from the earlier (Murphy and Wiltshire 2004a-b) and this phase of the excavations at Stansted has highlighted the very sporadic nature of the palynological record. In general, pollen preservation was very poor, making pollen analysis extremely time consuming, which is reflected in the very low resolution of some of the pollen diagrams. In several cases the pollen assemblages were very similar throughout a sample, with few changes, and therefore did not justify closer resolution. The quality of the pollen preservation at Stansted may be associated with the nature of the soil, depth of the ground water-table or the alternate wetting and drying of the fills. These conditions are probably not conducive for the optimum preservation of pollen grains, which ideally require waterlogged and anaerobic conditions. However the pollen from more robust pollen types, such as dandelion-type, alder and lime, can be preserved in more adverse conditions. These more robust types, which often produce very distinctive grains, can be identified even if pollen preservation is poor thus giving a skewed dataset. Other taxa, such as grass pollen, because of the presence of a single pore, surrounded by an annular thickening, can also be identified in conditions of poor preservation.

The unstable nature of many of the features is reflected in the records of pine and spruce pollen, Pre-Quaternary spores and dinoflagellate cysts in the fills, derived from the boulder clay underlying the site. This was highlighted by Patricia Wiltshire in her assessment report for this phase of excavation and was also recorded by the present authors.

Deliberate deposition into archaeological features also makes the interpretation of the pollen assemblages complicated, as it is extremely difficult to distinguish the pollen source of the assemblage. This may come from the deposited material and/or the local and regional environments, making it difficult to interpret whether the fills have recorded the local/regional vegetation or what was being incorporated into the features either accidentally or deliberately (Faegri and Iversen 1989). This is where the multidisciplinary approach is invaluable, as the study of the soil micromorphology, presence or absence of plant macrofossils, insects and molluscs, together with the palynological data, can help the palynologist to better interpret their data.

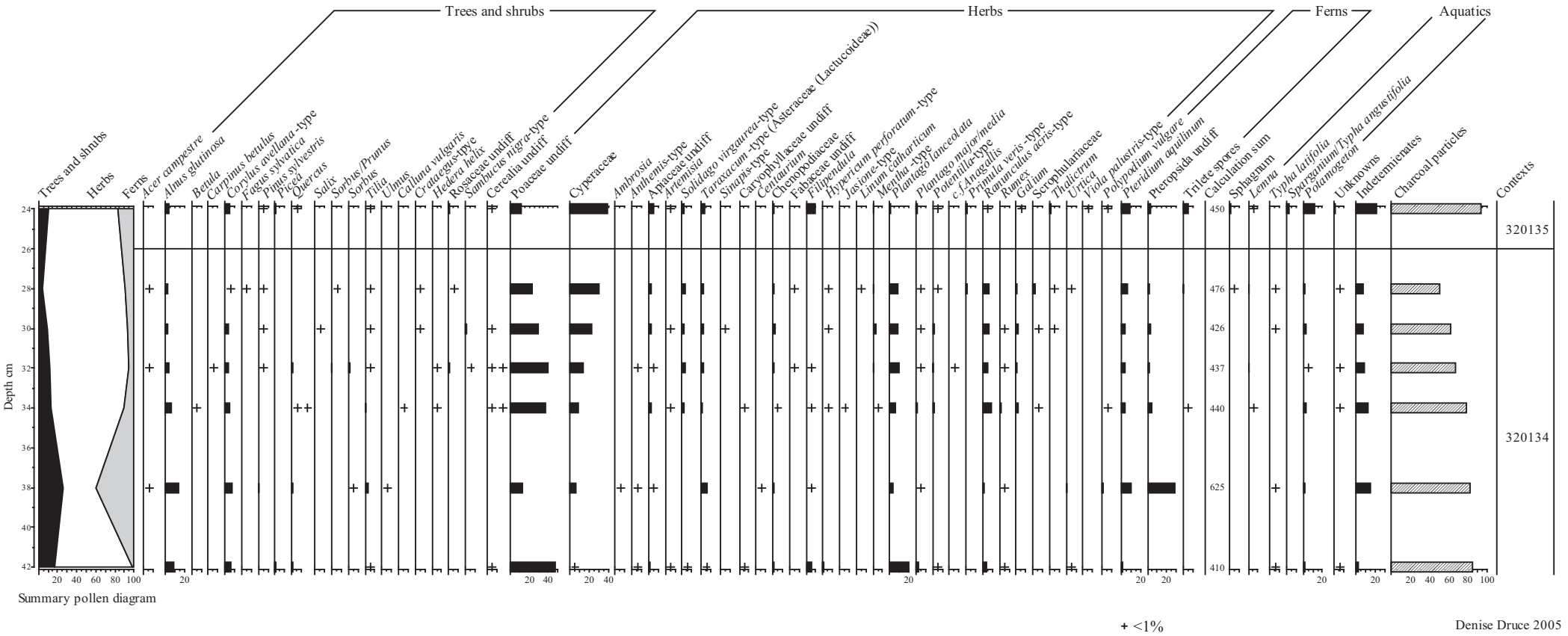
The interpretation of the pollen data from the ditch of the Middle Bronze Age round barrow was particularly problematic. The pollen record and the state of pollen preservation from what was described as a "peat deposit" in the field, and thought to be contemporary throughout the ditch, was very different from the side of the ditch nearer to the watercourse to that from the drier side. The pollen record from the wetter side was considerably more polleniferous than the drier one where the pollen record was sparse and the values of tree pollen low. These were considerably higher from the wetter side perhaps representing the nearby growth of scrubby woodland as the feature went out of use, which is suggested by the charcoal and plant macrofossil records (Gale, CD Chapter 35; Carruthers, CD Chapter 34). Palynologically it is difficult to definitively say that

what was described in the field as one "peat deposit" is in fact contemporary throughout the ditch, and the authors suggest that this may not be the case.

However, despite the problems associated with the interpretations of the pollen data at Stansted, the pollen data from the Middle Bronze Age, the 2nd- to 3rd-century ditch 205018 (samples 4001 and 4002), a late Romano-British pit 347041 (sample 2517) and a late Romano-British ditch (sample 359) do provide us with a picture of what the local vegetation and farming practices may have been like around the settlement in these periods. An insight into the vegetation of the Early Bronze Age and Anglo-Saxon periods has already been obtained from the palaeochannel sequence analysed by Patricia Wiltshire (Murphy and Wiltshire 2004a-b) and this later research has enabled the record to be extended for the Middle Bronze Age and for the Romano-British period. From the Middle Bronze Age onwards the landscape around the settlements at Stansted was largely cleared, with some small areas of woodland, hedgerows and parkland with stands of trees. Arable cultivation was recorded from the Middle Bronze Age through the Romano-British and Romano-British to the late and post-medieval. However the pollen data is indicative of grassland, suggesting pastoral farming, and waste ground were probably the dominant plant communities at Stansted in all periods studied.

Table 31.1: Samples assessed as to their suitability for palynological analysis

Sample No	**Feature no**	**Feature description**	**Feature date**
2667	324078	Barrow	Middle Bronze Age
2719/2702	324078	Barrow	Middle Bronze Age
2706	316118	Pit	Middle Bronze Age
6171	426015	Waterhole	Middle Bronze Age
5019	408014	Pit	Middle Bronze Age
2010/3	302043	Waterhole	Middle Bronze Age
4001	205018	Ditch	2nd-3rd century AD
4002	205018	Ditch	2nd-3rd century AD
2517	347041	Pit	Late Romano-British
359	143007	Enclosure ditch	Late Romano British
446	134059	Waterhole	Late medieval
908	464035	Pit	Post-medieval



Summary pollen diagram

+ <1%

Denise Druce 2005

Figure 31.1: Middle Bronze Age Sample 2719/2720, ditch fill of Barrow 324078
Percentage pollen diagram

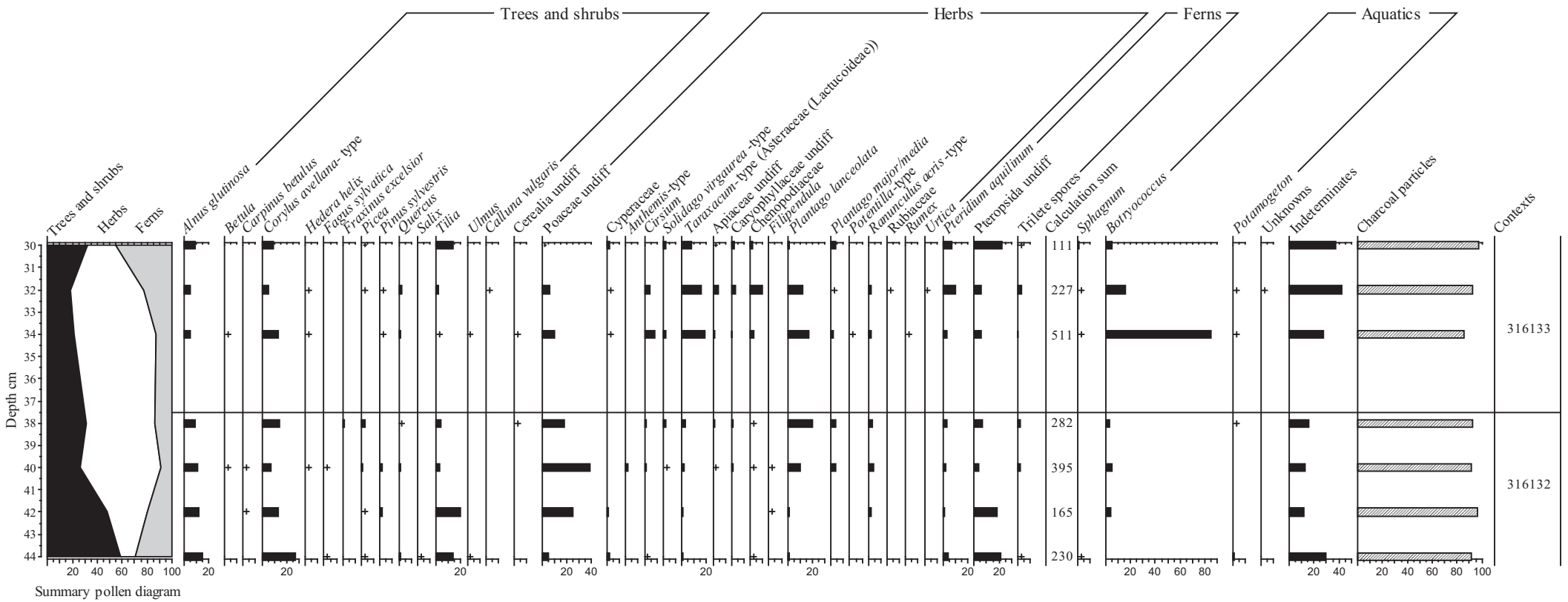
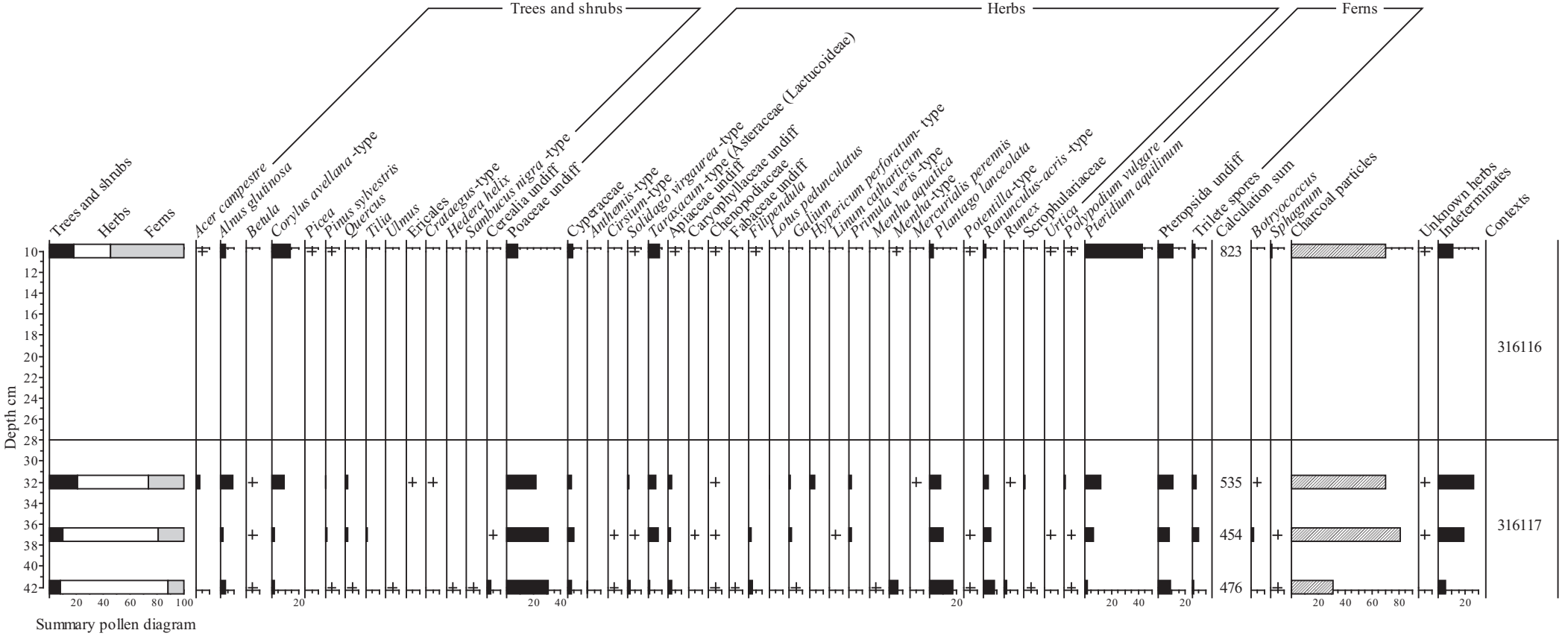


Figure 31.2: Middle Bronze Age Sample 2667, ditch fill of Barrow 324078
Percentage pollen diagram



Summary pollen diagram

Very low pollen frequency at 17, 22, 27, 48 and 58 cm

Denise Druce 2005

+ <1%

Figure 31.3: Middle Bronze Age Sample 2706, the fill of pit 316118
Percentage pollen diagram

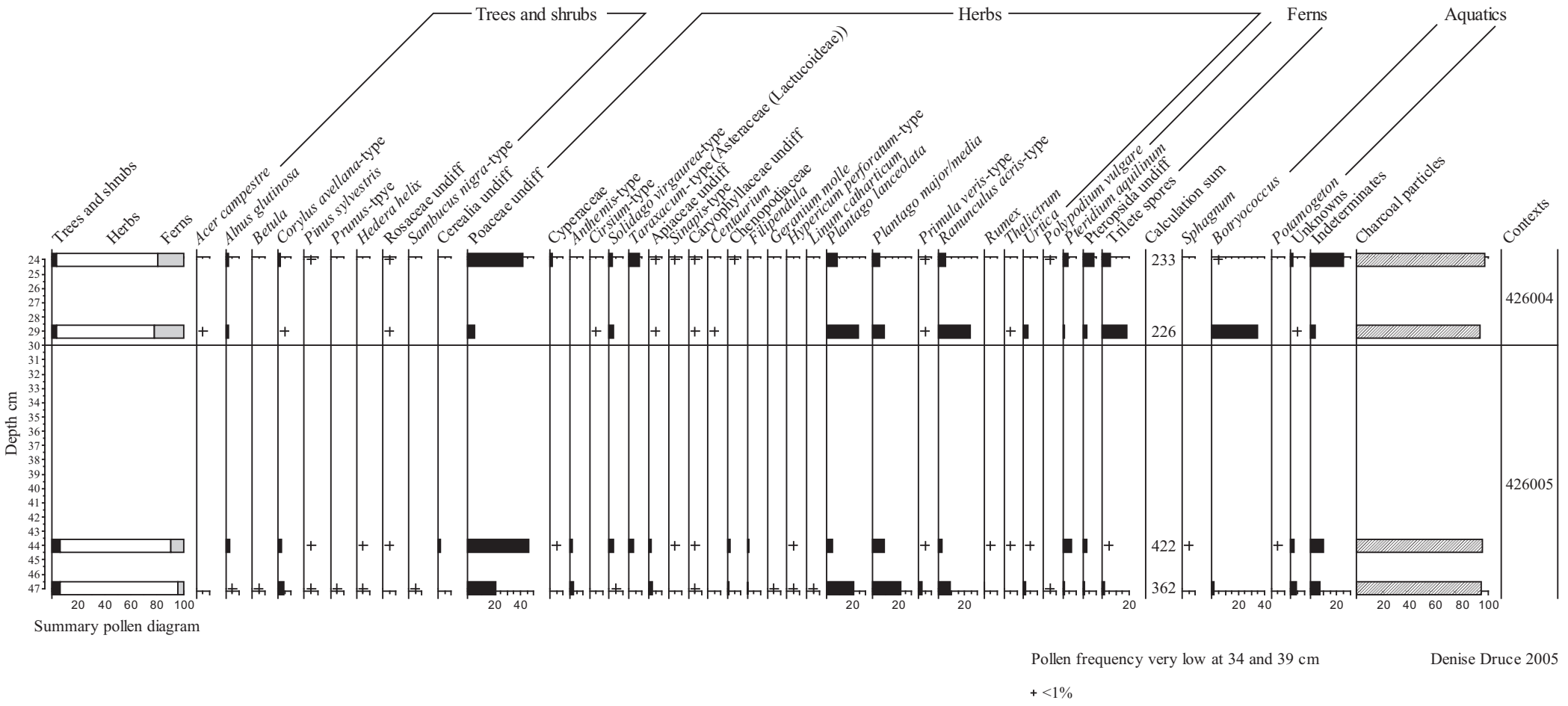


Figure 31.4: Middle Bronze Age Sample 6171, lower fill of waterhole 426015 (Contexts 426005 and 426004)
Percentage pollen diagram

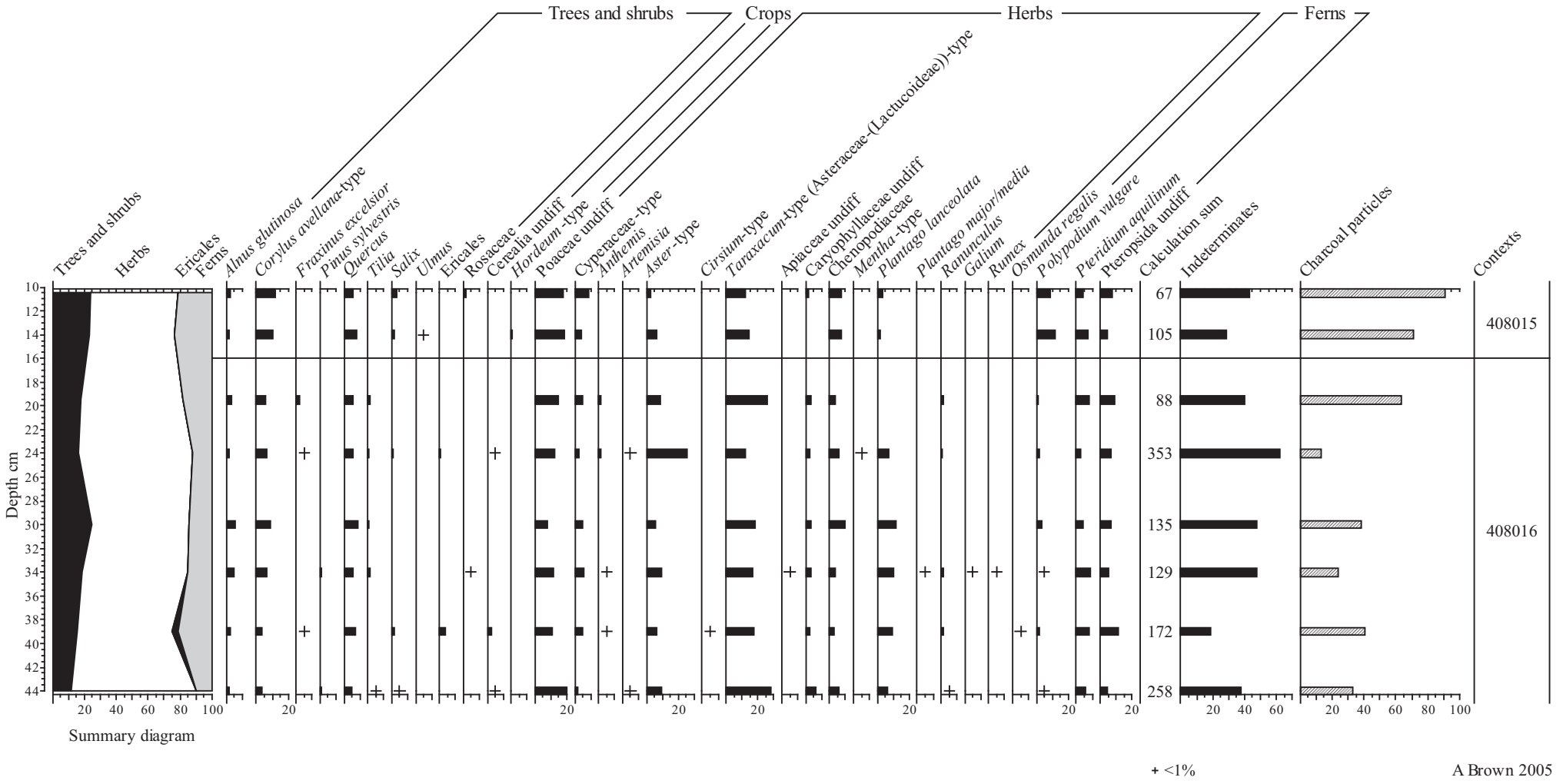


Figure 31.5: Middle Bronze Age Sample 5019, the fill of pit 408013
Percentage pollen diagram

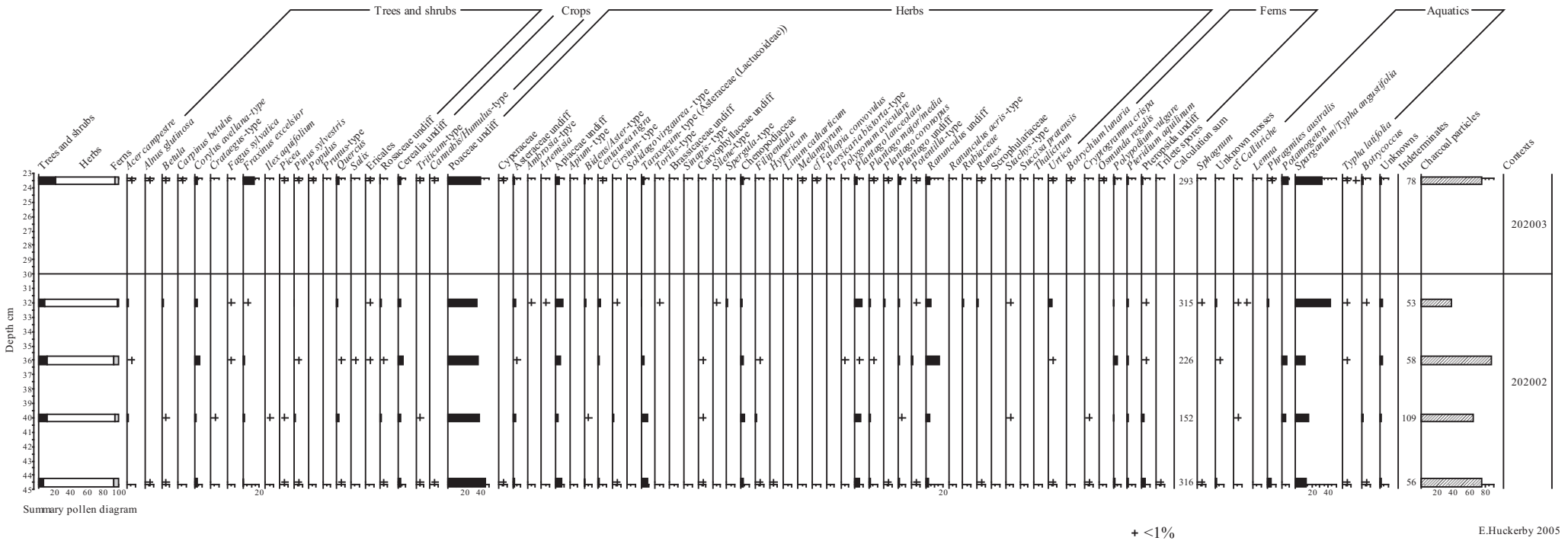
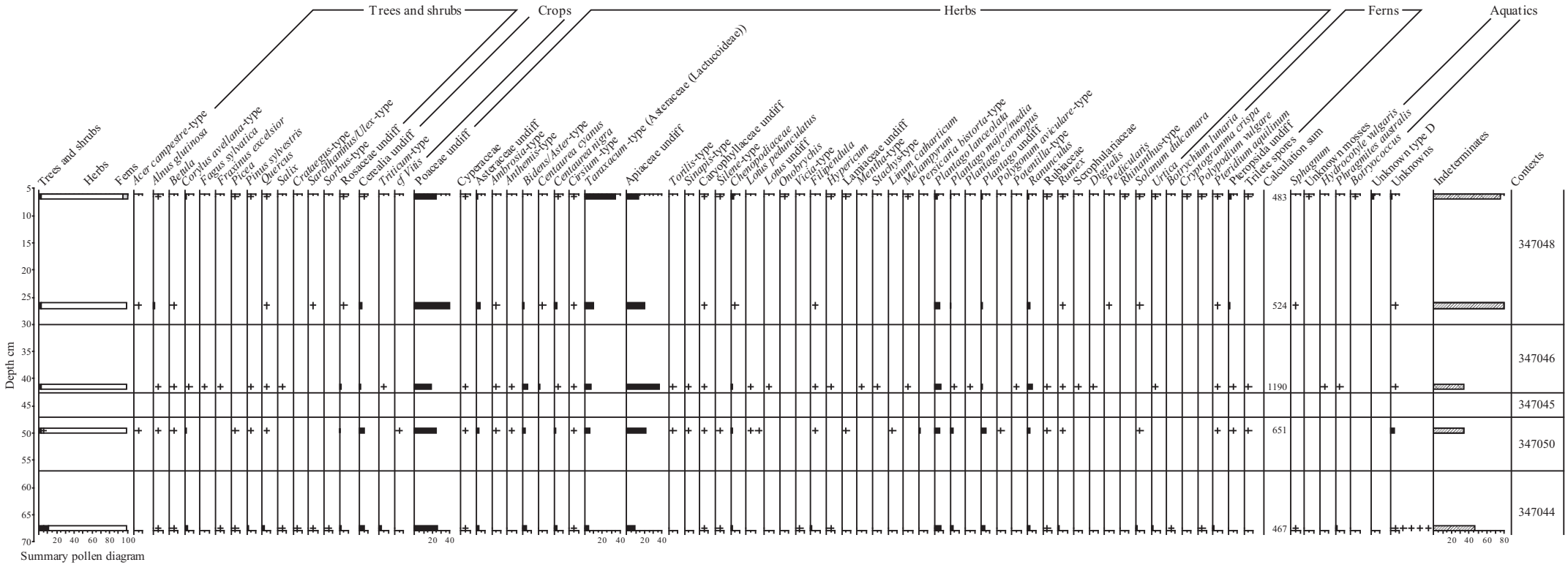


Figure 31.6: 2nd - 3rd century Sample 4001, the fill of ditch 205018
Percentage pollen diagram



Summary pollen diagram

Very low pollen frequency between 54.5 and 60.5 cm and charcoal particles too abundant to count in all samples

E.Huckerby 2005

+ <1%

Figure 31.7: Late Romano-British Sample 2517, the fill of pit 347041
Percentage pollen diagram

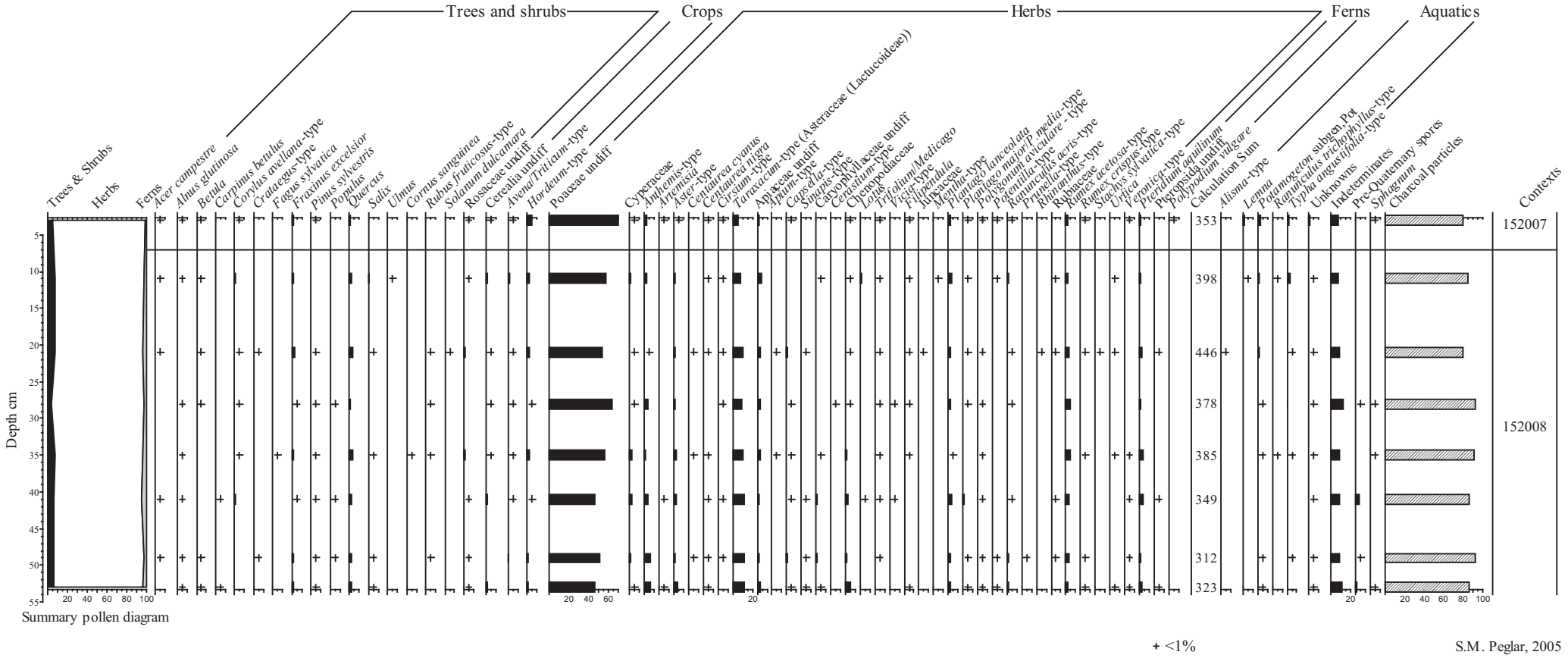


Figure 31.8: Late Romano-British Sample 359, the fill of enclosure ditch 143007
Percentage pollen diagram

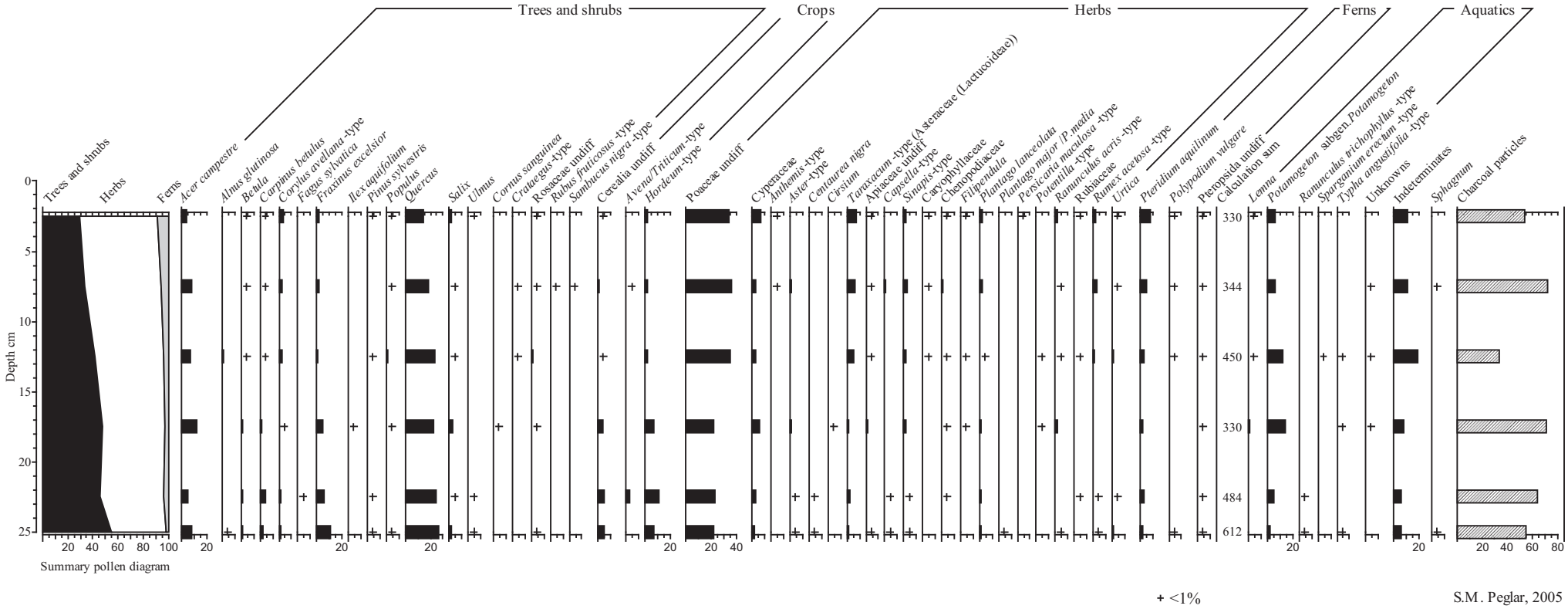


Figure 31.9: Late Medieval Sample 446, the fill of probable waterhole 134059 (Context 134063)
Percentage pollen diagram

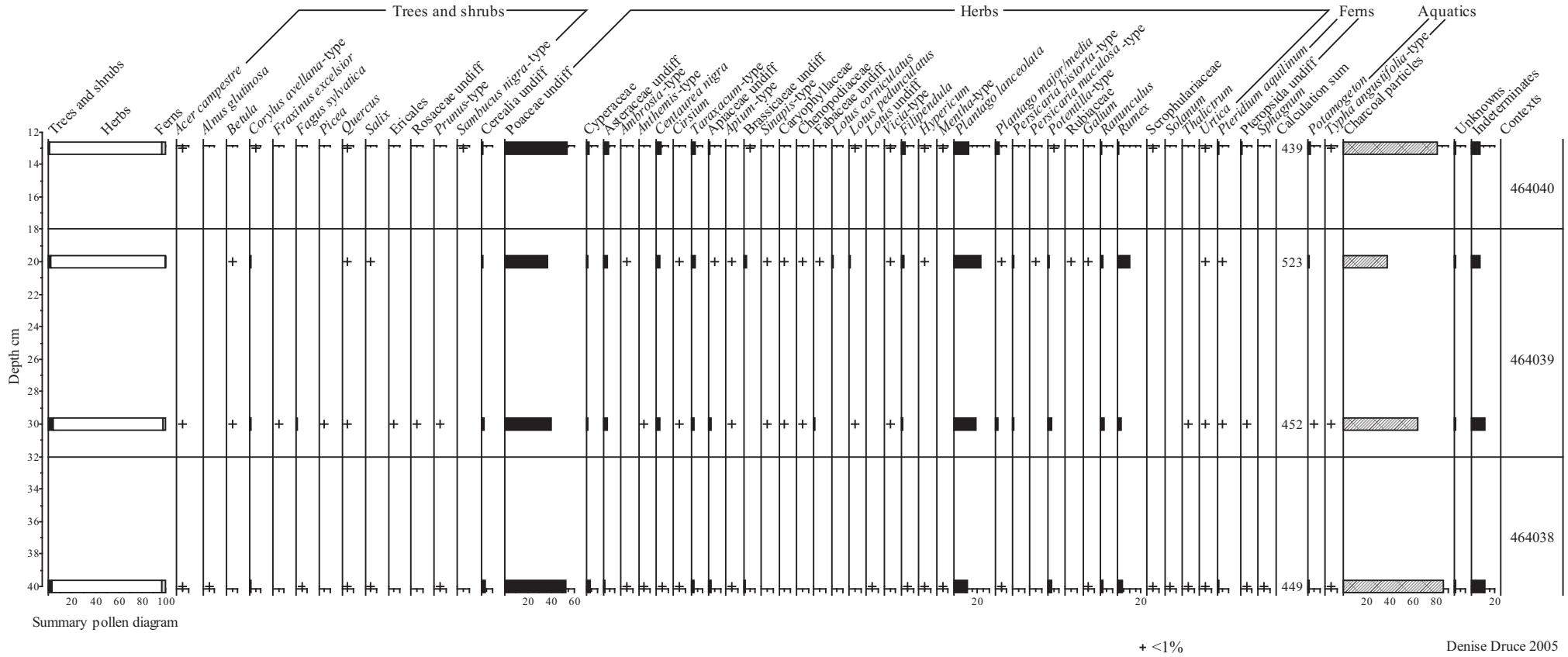
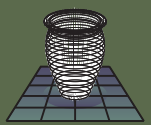


Figure 31.10: Post-medieval Sample 908, the fill of pit 464035
Percentage pollen diagram



Framework Archaeology

London BAA Stansted