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The vegetational history of Oldhall Copse, Old Woking

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The results of palaeoecological analyses and historical research are used to reconstruct the vegetational history of Oldhall Copse, Old Woking, Surrey. The value of this combined approach is central to this paper. Sediment samples taken from the moat surrounding the site, and the stewponds within, reflect essentially local pollen assemblages and these are compared with site-specific documentary evidence in an attempt to identify major land use changes. The moat record contains evidence of medieval and later cereal production, probably winter wheat, and the contemporary character of the farm as predominantly grassland. The stewpond record shows evidence of Corylus *coppicing over a considerable period followed by the cessation of active coppicing and the resultant unchecked growth of the stools. The relative merits and value of the palynological and documentary evidence are considered.*

Background

POLLEN ANALYSIS

Pollen analysis can offer evidence to enhance archaeological understanding of how ancient landscapes were managed and of past agricultural practices. The history of Woking Palace is well known and sufficiently researched to trace its development and subsequent decline in importance as a royal residence (Wakeford, 1989, 5–10). Much less, however, is known about the vegetational history of the moated palace site and the land use changes which would have accompanied the changing fortunes of the house. Pollen analyses of sediment samples taken from the moat and stewpond within the site should, if undisturbed, allow the vegetational history of the site and its immediate surroundings to be reconstructed from the late 13th century to the present day. Small undisturbed basins such as moats and stewponds frequently contain coherent pollen records but are relatively uncommon, especially when accompanied by considerable historical evidence (Bradshaw 1988, 738; Scaife 1996, 153). The medieval palace of Woking offered just such an unusual combination of features which justified further investigation.

The basic premise of fossil pollen analysis or palynology is that airborne pollen produced by flowering plants will eventually settle at ground level. Provided that anaerobic conditions are maintained and that the pollen is not physically disturbed, a stratified sequence will result, comprising the pollen and local deposits and/or sediments of varying forms (Moore *et al* 1991, 11). Airborne pollen can travel considerable distances but in closed canopy woodland conditions travels much less, with a maximum of 20–30m often suggested. Thus, this essentially reflects the vegetation of that area. Regional pollen input will be linked to the size and period of openings in the canopy.

THE STUDY SITE, (fig 1)

The area of study centres on the medieval moated site covering approximately nine acres situated on the alluvial flood plain of the river Wey (TQ 0292 5706). The documentary evidence suggests that part of the site has been continuously wooded since the 13th century, and the existing copse currently supports several species of ground flora which are indicative of ancient woodlands (Peterken 1993, 75). The moats have escaped damage from ploughing and, although parts have been infilled, the main moat system is still intact with banks and broad, flat-bottomed ditches regarded by Taylor (1978, 11) as indicative of minimal disturbance. The stewponds are

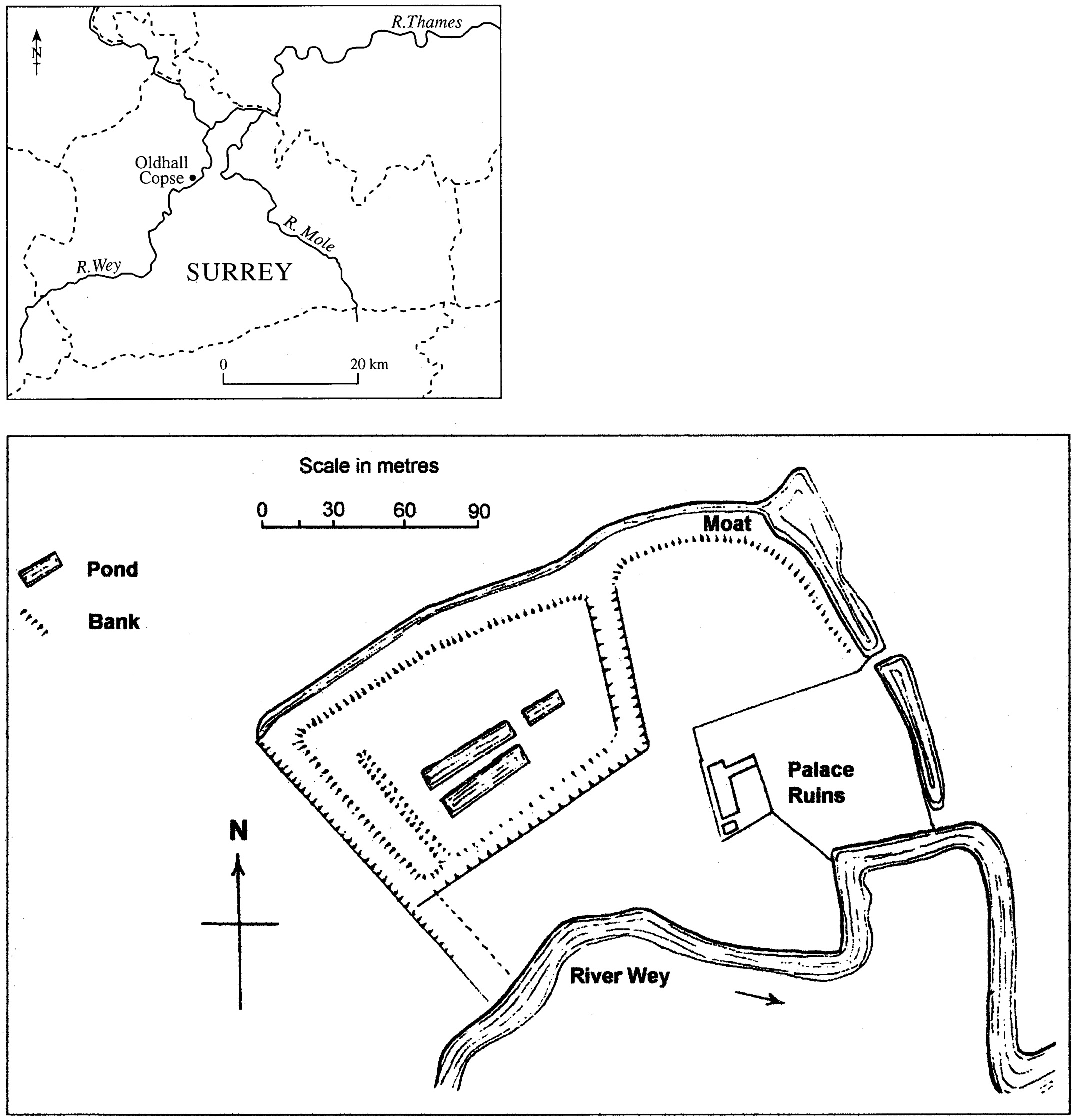


Fig 1 Oldhall Copse, Old Woking: site location

also intact although the original channels, between them and the moats to ensure fresh water, are now infilled.

DOCUMENTARY EVIDENCE

Of the considerable body of documentary evidence relating to Woking Palace and associated lands, only that which has relevance to past land use has been considered and this is summarized in table 1.

The date of the first construction of a manor house on the site of Woking Palace is not known. A grant in 1189 records stewponds, reservoirs or tanks, fisheries and gardens (Locke, undated). A small park was subsequently enclosed some time before 1236. The earliest specific reference is the listing of a 'Capital Mansion House' in a survey of 1272 and again in 1281 detailing a

TABLE 1 Documentary evidence relevant to land use

Date	Source	Event or Period
1189	Grant records	Gardens and stewponds mentioned.
1281	Inheritance record	Kitchen garden, gardens and 11 acre park mentioned.
1297	Correspondence	Great Park created.
1609	Survey	Distinction between Great and Little Park — stock excluded from the latter.
1843	Tithe map	Land use records for site and surroundings.
1882–1903	Cropping record	Records of crops grown on site and surroundings.
1909	Correspondence	Probable removal of some wood from copse.
c 1920	Interview	Abandonment of coppicing.
1964	Aerial photograph	Evidence of ploughing in fields enclosed by moat.
Between 1969 and 1975	Aerial photographs	Removal of *Ulmus* on southern and eastern perimeter of wood in response to Dutch Elm disease.

'curtilage (kitchen garden) and gardens . . . a small park of 11 acres' (Manning & Bray 1804, **1,** 118). The house was considerably enlarged during the period 1297–9 and a 'Great Park' was created. The most detailed survey of the site is dated 1327 which mentions 'a Curtilage and Garden with fruit trees' (*ibid*, 119).

The History of the King's Works (Colvin 1982, 344–8) makes specific reference to Woking and, of particular interest, the frequent construction and repairs to wharves and bridges, especially those in 1534, which made the east side of the moat navigable to barges. In 1537 two areas were built for recreation. One was in the king's garden 'for the King to boulle in' and the other in the orchard 'for the Kyng and Quene to walk in' (*ibid*, 345).

After Henry's death in 1547, Woking was only occasionally used and little maintenance work was recorded in the accounts. The moat, which originally ran north–south and divided the site in two, was partially filled in with earth in 1580 leaving the now visible projecting middle arm. In 1593–4 the moated site was said to be damp because the system for raising water for the moat by waterwheel had been abandoned, and the upstream end of the moat had been breached, allowing the river to run in (Wakeford 1989). The palace had fallen into a ruined state by 1634 (*VCH,* **3,** 383) and has not been inhabited since.

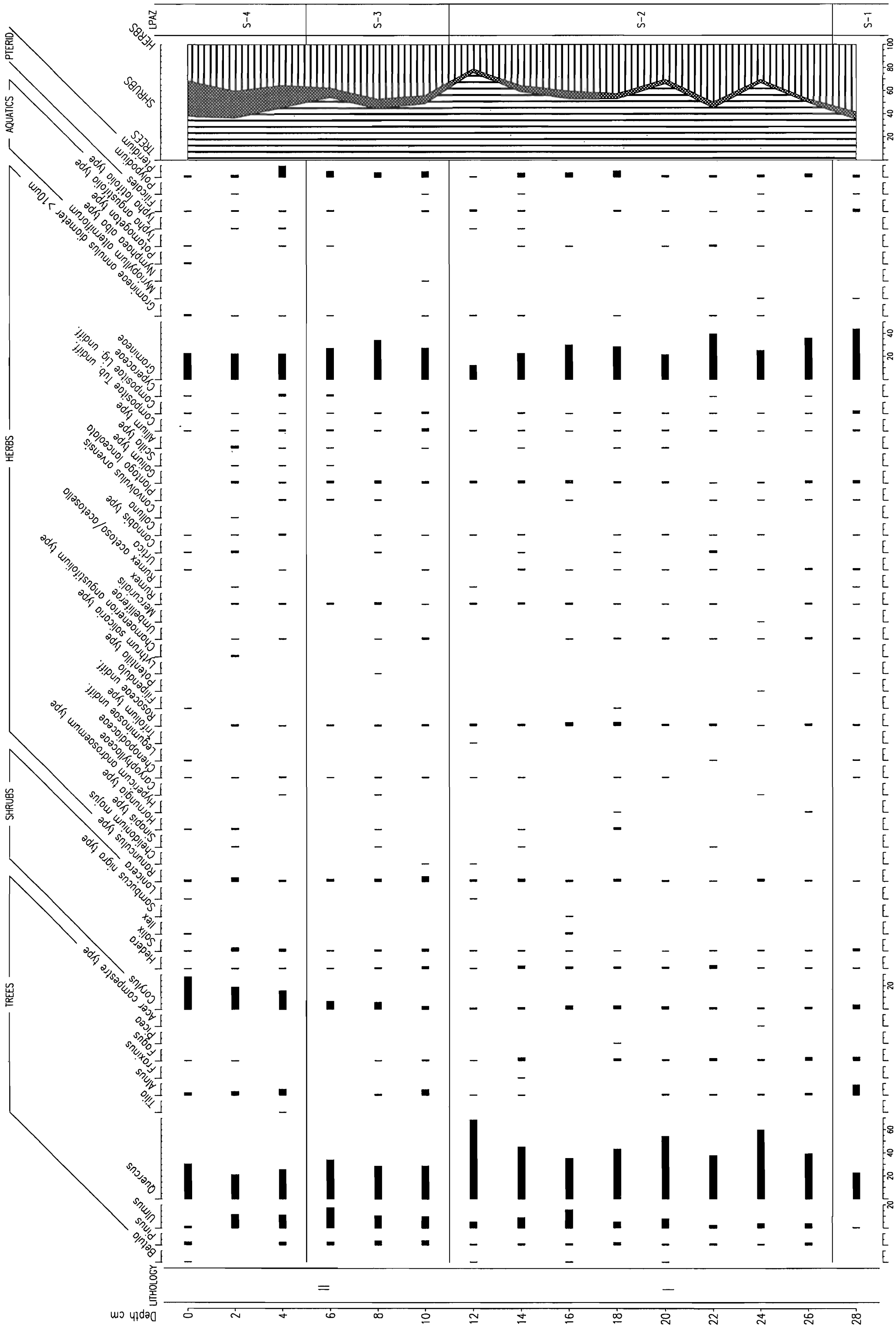
The earliest surviving map of the site is John Norden's survey of royal parks in 1607 which shows the palace and wood in some detail, and also the extent of the deer park which enclosed the lands along the river to Woking village and northwards to the course of the present railway line. The next map to show the moated area and, most importantly, the wood is by 'John Remnant of Guldeford' dated 1739. The earliest OS map published in 1874 (surveyed in 1870) first uses the current name of Oldhall Copse. The tithe map of Woking East dated 1843 shows the copse and records the use of all the field divisions in and around the site.

A tenancy agreement for Wokingpark Farm dated January 1876 records the same land use except for Bakers Mead which is listed as pasture. The agreement specifically forbids the felling, cropping or damaging of trees on the farm. Cropping records exist for the farm covering the period 1882–1903. In July 1909 the tenant, Carter, wrote to Lord Onslow's farm manager to request timber for farm fencing, posts, rails and boards. The letter implies that some timber would come from the copse.

Aerial photographs of the area show little or no change in the stand since 1942, except the *Ulmus* felling between 1969 and 1975. The open ground within the moat system surrounding the ruins had been ploughed during this period and two very small ponds had been filled in.

Methodology

Sediment cores were collected from the moat and stewpond using a Russian auger and piston corer respectively. Subsampling intervals within the cores were selected to offer the finest practical resolution and to take account of any major changes in sediment composition. These subsamples were then subjected to chemical and physical procedures to remove elements of the


LPAZ
S-4
S-3
S-2
S-1
TREES
SHRUBS
HERBS
AQUATICS
PTERID.
POLLEN SUM = TLP
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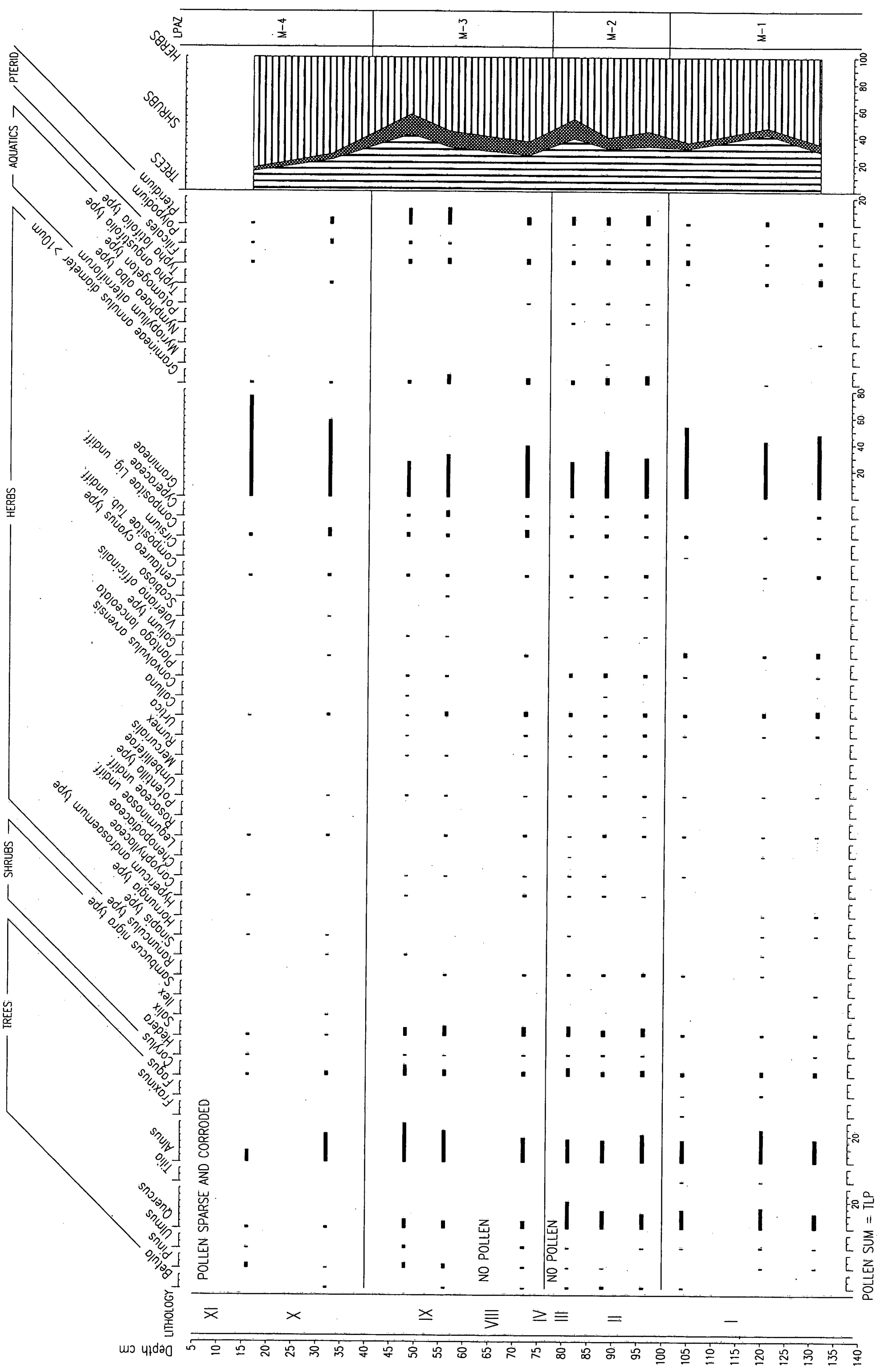
Depth cm



Figs 2 & 3 Oldhall Copse, Old Woking. Fig 2 (facing page): Stewpond percentage pollen diagram — trees, shrubs and climbers, herbs, aquatics and pteridophytes. Fig 3 (above): Moat percentage pollen diagram — trees, shrubs and climbers, herbs, aquatics and pteridophytes sediment such as silica, calcium carbonate, humic acid and cellulose until hopefully only the pollen remained (Moore *et al* 1991, 39–41). This material was then stained, mounted and examined at a magnification of x400 or x1000 using an Olympus BH-2 microscope. At least 300 grains were counted at each sample level. Identification and pollen types follow Moore *et al* 1991, taxonomy according to Clapham *et al* 1989. The pollen sum used is total land pollen (TLP). The resultant pollen data were stored and pollen diagrams prepared using the TILIA GRAPH program (Grimm 1991). The pollen assemblage zones were determined by cluster analysis using the CONISS program (Grimm 1987).

Results and interpretation

The results of the pollen analyses are presented as percentage pollen diagrams (figs 2, 3) with pollen concentrations provided for select taxa in figures 4 and 5.

STEWPOND

Four pollen assemblage zones have been defined:

S-1:	28–27cm	(Gramineae – *Quercus* – *Alnus* zone)
S-2:	27–11cm	(*Quercus* – Gramineae – *Ulmus* zone)
S-3:	11–5cm	(*Quercus* – Gramineae – *Ulmus* – *Corylus* zone)
S-4:	5–0cm	(*Quercus* – *Corylus* – Gramineae – *Ulmus* zone)

The historical presence of *Quercus* within the wood is suggested by the high frequencies within the pollen record. Medieval timbers (predominantly oak) were felled quite young in comparison with what constitutes a mature tree today. The most commonly used were Rafter oaks of up to 6 inches in diameter which represents 20–70 years growth (Rackham 1980, 207). The fluctuation in *Quercus* pollen percentages and concentrations in zone S-2 may reflect the periodic thinning of oak standards. There is a sharp fall in *Ulmus* pollen in the top sample in zone S-4.

Corylus pollen percentages are uniformly low in the lower portion of the profile but begin to rise from the bottom of zone S-3. It is possible that these slight increases were as a result of the increase in coppicing cycles in the 19th century which might have allowed more flowering. More significant increases, supported by the pollen concentration data, are seen in zone S-4. This period possibly represents the time since the complete abandonment of coppicing, probably around the end of the 19th century. The stewpond sediment profile contains less sand in the top 12cm which may reflect lack of trampling disturbance after the abandonment of coppicing, particularly if it used to be carried out in wet conditions (Barkham 1992, 119), but may also be due to decreased rainsplash erosion because of the greater foliage cover (Tricart & Kiewiet de Jonge 1992, 31).

MOAT

Four pollen assemblage zones have been defined:

M-1:	138–100cm	(Gramineae – *Alnus* – *Quercus* zone)
M-2:	100–77cm	(Gramineae – *Alnus* – *Quercus* – Pteridophytes zone)
M-3:	77–40 cm	(Gramineae – *Alnus* – Pteridophytes zone)
M-4:	40–0cm	(Gramineae – *Alnus* zone)

Pollen records of aquatic species appear to be concentrated in the lower half of the moat profile and especially in zone M-2. This probably represents the period when the moat water level was actively managed and maintained. *Potamogeton*, *Nymphaea* and *Myriophyllum* are all associated with slowly moving or still, but not stagnant, water (Clapham *et al* 1989, 54, 270, 522). This is consistent with the likely conditions in a medieval moat (Taylor 1978, 11).

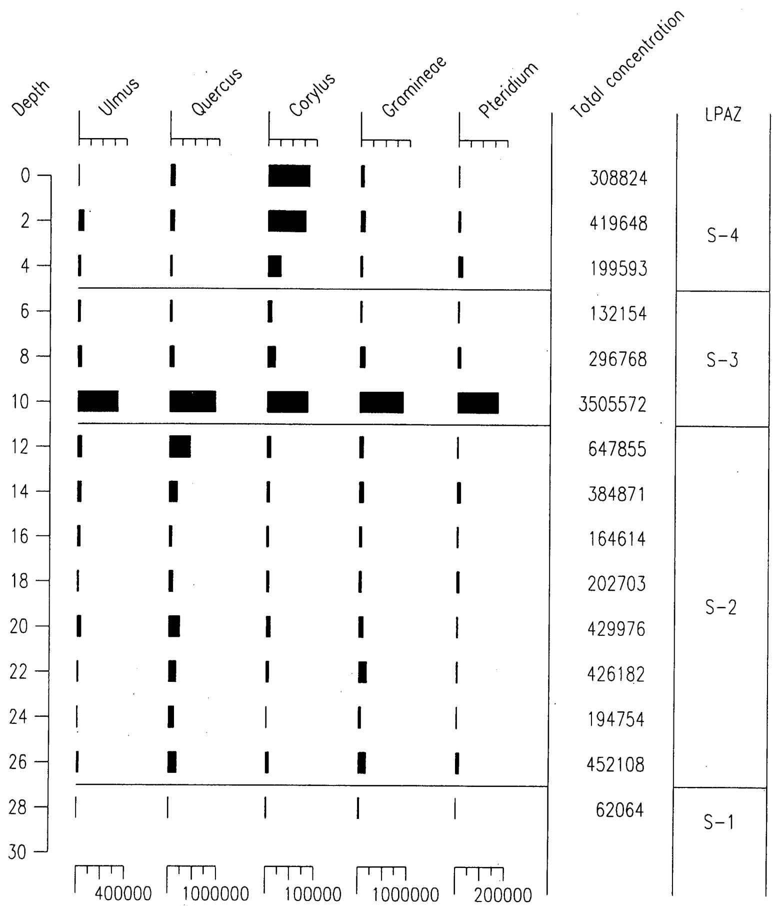


Fig 4 Oldhall Copse, Old Woking: stewpond pollen concentration data for select taxa. Note changes in horizontal scale.

Only the moat profile records an appreciable presence of Graminae annulus diameter $> 10\mu$ (which includes cereals) pollen, with some high percentage values in zones M-2 and M-3 probably reflecting the north-facing aspect of the moat on to open land. *Centaurea cyanus* (cornflower) pollen also increases in zone M-2 and this is widely regarded as a weed of medieval cereal crops, especially winter wheat (Green 1984, 111; Greig 1986, 47). This pollen may derive from faecal contents of the moat although the sampling site was well away from the central arm of the moat nearest to the palace. The concentration diagram indicates absolute increases in this cereal-type pollen in zones M-2 and M-4.

The moat profile is not especially dominated by Gramineae although proportions do increase significantly towards the top of the sequence. The increase in Gramineae pollen in zone M-4 may represent an increase in the area of grassland on the farm since the First World War. The very low pollen values recorded for most herbs throughout the sequence preclude confidence in their use as indicator species. Of those species for which there is a consistent record, *Plantago lanceolata* and *Ranunculus* type (both regarded by Behre (1981, 241) as strongly indicative of wet meadows and pastures) are present in zones M-2 and M-3. There is an appreciable diminution in the range of herbs present in zone M-4, especially nearer the top of the sequence, and this is matched by the proportional increases in Gramineae pollen.

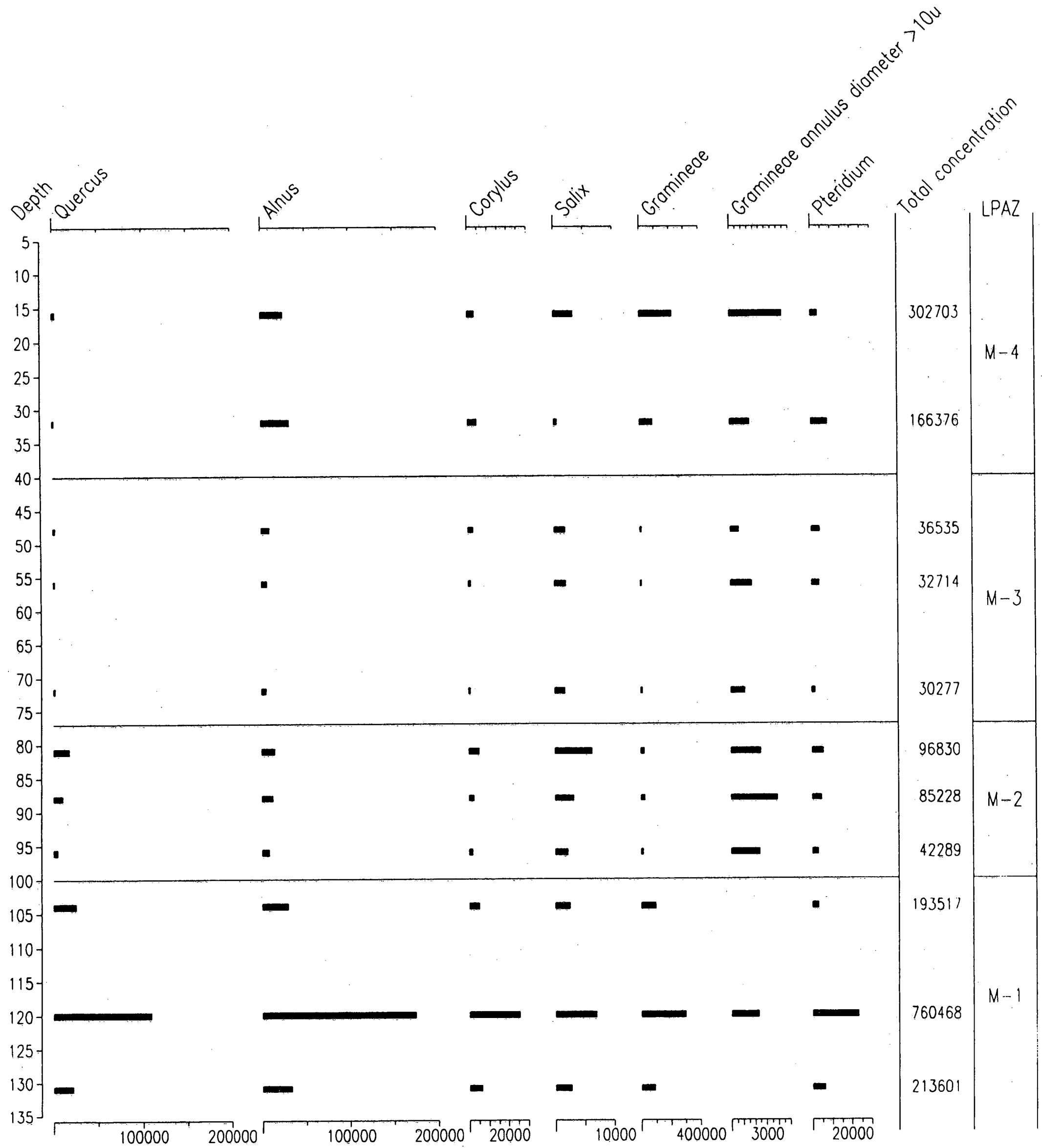


Fig 5 Oldhall Copse, Old Woking: moat pollen concentration data for select taxa. Note changes in horizontal scale.

There is a decrease in concentration and percentage levels of *Quercus* pollen in zones M-3 and M-4, and this may reflect the clearance of large mature trees from the parkland to facilitate easier farming.

The *Alnus* pollen record is appreciable in the moat sequence but negligible in that of the stewpond. There is no *Alnus* in the wood today but a single large tree stands near the site of the reservoir used to raise water for the moats. Inwash from this source (or its predecessors) may account for the presence of *Alnus* in the moat record; the fall in these values near the top of the sequence may represent the effective isolation of the moat from the upstream river. The concentration diagram, however, does not indicate an absolute fall in *Alnus* values at the top of zone M-4.

No macrofossil evidence was found of any dumping of domestic waste in the moat profile or of any exotic imports such as figs or grapes possibly associated with a royal palace (Green 1984, 110).

Both profiles are complicated by the potential contamination of local assemblages by inwashed material from surface water (Greig 1986, 47). The possibility of contamination with material from further afield is greater for the moat sequence, reflecting its closer hydrological links with the river, especially after the late 16th century when a channel was cut at the upstream end of the moat system allowing connection to the river. There are no records to suggest when this upstream opening to the river was closed and infilled, or when the stewponds were isolated from the moat system, both of which would decrease the amount of inwashed material.

Comparison of pollen sequences with the historical record

Palynologists tracing vegetation history often use absolute dating methods such as ^{14}C in order to establish a chronology for a sediment sequence. Vegetation changes shown by the pollen data can then be dated. Such methods are inappropriate for relatively recent and organic-rich sediments such as those from Oldhall Copse. It is, however, possible that some of the recorded events or periods of change may be reflected in the pollen profiles. The possible events or period are listed together with their sources (table 1) and will be considered in turn.

The pollen records of the moat and the stewpond are materially different, partly because the two sampling sites record vegetational change at different spatial scales. The stewpond profile is assumed to obtain from an intermittently, and latterly permanently, closed canopy environment. The moat catchment is, however, more complex comprising the woodland on the south side and a more open face on to farmland to the north. Pollen from the surrounding area will have had more consistent influence on the moat profile although it will also have contributed to the stewpond record (Bradshaw 1988, 748).

Neither profile shows any clear evidence, in the form of increased levels of *Rosaceae* pollen, for the existence of a 'garden with fruit trees' which may have been elderberry (*Sambucus nigra*), cherry (*Prunus cerasus*), apple (*Malus sylvestris*), pear (*Pyrus pyraster*) or plum (*Prunus domestica*) (Green 1984, 108). This may be because such trees are insect pollinated and thus contribute little to the pollen record, or it may be that neither core attained the depth required to contain such a record, or that any early sediment has been removed by dredging. Similarly there is no indication of the kitchen garden, which might have been indicated by raised levels of *Leguminosae* pollen, in the sequence from either source. Such a garden might reasonably have contained peas (*Pisum sativum*) and beans (*Vicia faba*) which were commonly used for feeding horses and paying labourers in kind (Green 1984, 107), together with a variety of herbs and vegetables mentioned in various medieval documents, eg parsley, leeks, sage and mustard. *Cannabis*-type pollen (which includes *Humulus*) does occur with reasonable consistency throughout the stewpond sequence and *Humulus* is present in the wood today. Both *Cannabis* and *Humulus* were common crop plants in medieval times, the former for fibres (hemp) and the latter as a garden crop. Rackham (1980, 125) suggests that areas of young coppice were fenced to protect them from deer and it may be that the copse was such an area and the garden with fruit trees mentioned in the surveys was immediately south of it. Underwood products such as hurdles, fencing, hop poles and, most importantly, faggots for the bread ovens, would have been required for the hall, and maintaining a small grove for this purpose was not uncommon (Stamper 1988, 146).

The creation of a deer park in 1297 and the resultant management of the land for grazing would ensure a constant and significant input of Gramineae pollen especially to the moat catchment. The 1609 survey clearly shows the 'Towne Lawne' and such lawns or launds were areas for grazing only with no trees at all (Rackham 1990, 155). In reality no one zone is especially dominated by Gramineae, although proportions do increase significantly towards the top of the sequence. A possible explanation for this, and the increasing proportions of cereal-type pollen in the middle of the sequence, is afforded by the same survey which delineates the 'Little Park' from which deer were excluded. It may be that this was to allow crop (cereal) production on the land which was well enough drained. Oldhall Field, for instance, is recorded as arable on the tithe map and supports barley today. From the second half of the 14th century onwards it was not uncommon for parks, with their very expensive maintenance costs, to contain some arable land in an attempt to increase income (Stamper 1988, 146). The documentary evidence suggests that the grassland around the site remained predominantly pasture for grazing rather than meadow for hay despite the regularity of winter flooding. Greig (1984, 213) suggests that a combination of pollen and seed records may allow differentiation between grassland and hay meadows despite the similarity in their associated species. Unfortunately, seed identification was outside the scope of this study and the very low pollen values recorded for most herb species in the sequence preclude confidence in their use as indicator species. Of those species for which there is a consistent record, *Plantago lanceolata* and *Ranunculus*-type (both regarded by Behre (1981, 235–41) as strongly indicative of wet meadows and pastures) are present in zones M-2 and M-3. There is an appreciable diminution in the range of herbs present in zone M-4, especially nearer the top of the sequence, and this is matched by proportional increases in Gramineae pollen. This accords with the condition of the grassland around the site today which is species impoverished, poorly managed and undoubtedly bears little resemblance to its medieval or even 19th century counterpart.

The park was destroyed at the time of the Civil War (*VCH,* **3,** 384). No records have been found to shed light on the land management regime between the early 17th century and the early 1840s, thus it is not possible to determine when the deer park was compartmentalized into the field system shown on the tithe map and still partially visible today.

The tithe map provides a snapshot of agricultural and land management activity in the mid-19th century. The wood is described as coppice implying that there was still an appreciable degree of human activity and thus disturbance at this time. The cropping records, from 1882 to 1903, provide considerable detail of the range of crops grown both on and around the site. These data are not clearly reflected in the pollen record although there are instances of *Cruciferae* pollen (which includes the Brassicas) at various depths within the moat sequence. This is probably because the flowering tuber and legume crops are insect pollinated (the pollen does not transport long distances) and furthermore the Brassicas and remaining root crops do not flower before harvesting. Behre (1981, 227) highlights the problems of pollen identification associated with crop plants in that many important species cannot be distinguished beyond genus level, eg *Cruciferae* and *Leguminosae.*

Although referred to as coppice from 1843 onwards, the history of coppicing activity in the wood is not clearly documented, almost certainly because it was too small to be of any great economic importance. It is, however, possible that the entire wood was coppiced at one time rather than by compartments, as is typical of larger woods. Small but consistent percentages of hazel *(Corylus avellana)* pollen in the lower portion of the stewpond sequence suggest that regular coppicing was carried out, thus suppressing flowering and pollen production. The steady increase in *Corylus* values towards the top of the sequence can be linked to the abandonment of coppicing and the subsequent growth of the stools with an attendant increase in flowering. No evidence of coppicing cycles can be seen in the herb pollen record in which shade tolerant herb species might have shown periodic cyclical variations associated with the light and dark phases of coppicing rotation (Barkham 1992, 116). Alternatively, if frequent coppicing prevented significant development of the canopy, shade tolerant herb pollen input might have been uniformly low. The recorded values for the herb species are very low. Increased counts might reveal more diversity of types.

The possible removal of some timber from the copse for maintenance work on the farm in 1909 is not clearly reflected in the pollen record, but may explain the dozen or so exposed stumps visible in the wood today.

The sharp fall in *Ulmus* pollen recorded between samples taken at 2cm and 0cm in the stewpond almost certainly corresponds to the onset of Dutch Elm disease and the associated felling of mature elms around the perimeter of the wood between 1969 and 1975. The decrease in *Ulmus* pollen near the top of the stewpond sequence is not preceded by a tailing off of pollen percentages marking the decreased flowering of diseased trees (Perry & Moore 1987, 326) but this may be due to insufficient temporal resolution of the diagram.

Conclusions

The evidence presented by pollen analytical studies can be of value to both palynologists and landscape historians.

Palynologists look for evidence of processes and patterns when interpreting pollen sequences but the lack of modern analogues for many historical land management practices and phytosociological groupings can limit such interpretation. Coppicing is a traditional form of wood management dating back to earliest recorded history and beyond (Rackham 1977, 66) but largely abandoned from the turn of the 19th century until recent rekindled interest. There is very little data available on the pollen production of species in modern coppiced woodland but Bradshaw (1981, 53) observes, from a contemporary site having coppice with standards management, that continual coppicing produces many small stems which do not flower as heavily as do a few mature trees. The combination of little or no disturbance of the Oldhall Copse sequences together with the documentary evidence of coppicing over a considerable period offered the potential to identify patterns of coppicing within the pollen record. This information may help future workers to interpret pollen sequences showing the same patterns of coppiced hazel pollen percentages. Inferences may also be drawn about consistently low *Corylus* pollen percentages in sequences without other evidence of hazel either historically or in the contemporary vegetation.

Landscape historians look for evidence of past land management practices. The evidence provided by pollen analysis can support their hypotheses. For example, evidence of medieval arable farming and management of the moat system are present in zone M-2, and the decline in arable farming with the attendant rise in rough grazing of the land since the early 20th century are reflected in the uppermost portion of the sequence. The stewpond profile closely reflects the changing woodland management practices within the copse and chronicles the decline in traditional woodland management.

When considering sources of evidence in archaeobotanical studies, documentary and palynological data have a number of specific strengths and weaknesses. Documentary evidence can provide indications or evidence of land/resource utilization and/or management techniques which may be reflected in the pollen record. Documentary evidence can provide descriptions across a range of spatial scales but can be difficult to tie down to a specific site. Pollen analysis can reflect essentially local processes or those across a range of spatial scales depending upon the choice of site. Palynological data can reflect a continuum of environmental change given certain favourable conditions whereas documentary records can fix events of periods of change absolutely.

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