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THE ENVIRONMENT OF BODIAM: LAND, VEGETATION, AND HUMAN IMPACTS

Kathryn A Catlin, Penny Copeland, Matthew Johnson, Rob Scaife[1]

Abstract. This chapter reports on pollen and stratigraphic analysis of multiple soil cores extracted from the landscape in and around Bodiam Castle. Over the last six thousand years, the Bodiam landscape has shifted from wet alder carr fen woodland to seasonal floodplain. The critical changes occurred during the Bronze Age, when deforestation by local communities to create fields for arable agriculture led to significant erosion and alluvial sedimentation. As a result, the river channel deepened and widened, the wetland expanded, springs developed, and the river Rother began to regularly flood its banks. These alterations set the stage for the development of the Roman and medieval harbours, and later, for the excavation of the moat and watery landscape in which Bodiam Castle is set. The landscape and ecology of Bodiam's position between the floodplain and the Weald has been critical to understanding its place through millennia of interaction between human life and agricultural practices.

Introduction

Bodiam Castle is situated on the boundary between the Rother floodplain and the Weald (Chapter Two, this volume, Figs 2.1 & 2.3). This critical location, at the convergence between two environmental zones, has had significant effects on both the environmental and social histories of the landscape. Over the last five millennia, changes in climate, movement of the river, and human activities have led to multiple transformations between riverine, woodland, wetland, and grassland ecosystems. Each new environmental development represented a change in the way people related to the landscape, including different agricultural methods, transportation and commercial infrastructure, and the range of possible choices available for construction and landscape alteration.

In this chapter, we set out to identify and describe the geological, hydrological, and vegetation history of the immediate environs of the castle. This dynamic environmental context sets the stage for the daily lives and practices of the people who lived and worked here, both defining the range of possible productive activity and comprising the materiality through which inhabitants and visitors have understood their relationship to the land and society. When did people begin to actively farm at Bodiam, and what crops were they growing? Where were the medieval ponds located, and what is their earlier history? What sort of managed woodlands have grown near Bodiam since Roman times and earlier? How might the moat construction have taken advantage of existing landscape features? The environmental context of the Bodiam landscape during the medieval period may suggest why the inhabitants found this an ideal location for a village and castle. Finally, how does all of this accumulated environmental history affect the way the landscape was understood during the later Middle Ages, and the ways in which the Bodiam landscape is experienced and modified today?

1 The pollen analysis was conducted by Rob Scaife. A longer and more detailed report on the results of the Bodiam coring and pollen analysis was written by Rob Scaife and Penny Copeland (Scaife & Copeland 2015, available at http://sites.northwestern.edu/medieval-buildings/). Kathryn Catlin prepared this more concise chapter, with further edits by Matthew Johnson.

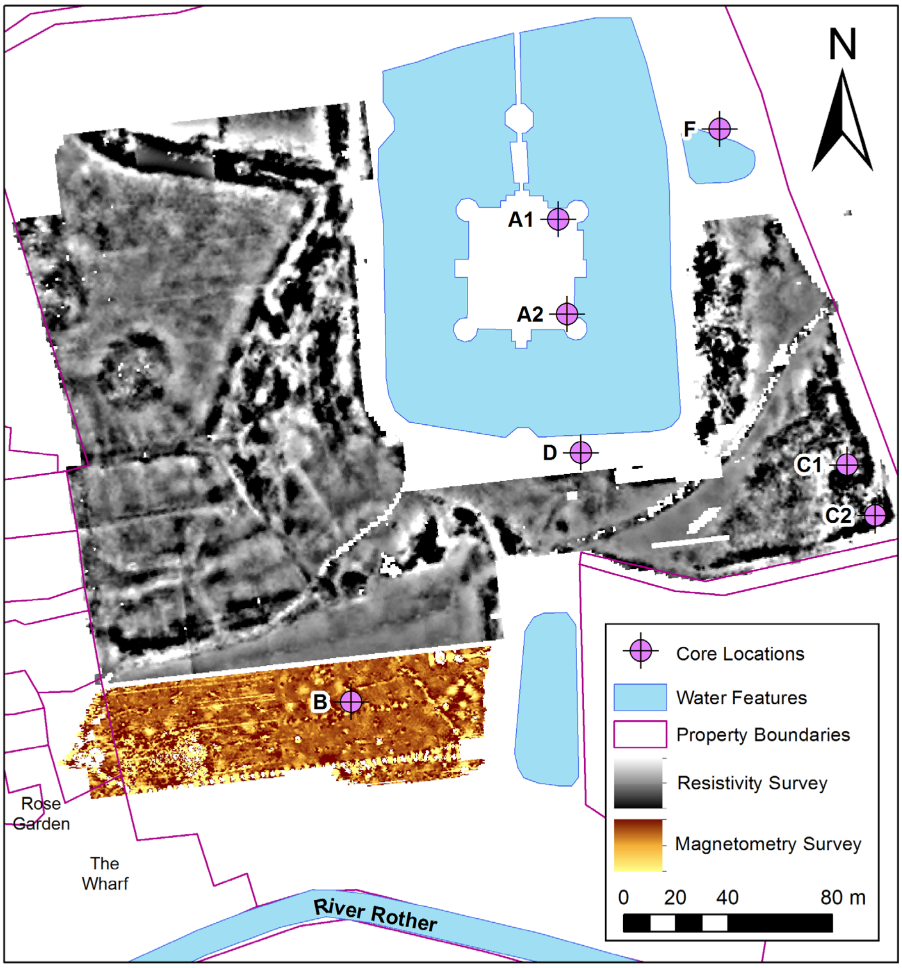


Fig. 5.1: Coring locations relative to the Bodiam grounds. Note the linear resistive anomalies near cores C1 and C2 (the possible mill yard or cattle yard), and the linear magnetic anomalies in the overflow car park/mill pond near core B (likely Curzon's 1920s drainage works).

To address these and other questions, we employed soil coring to collect a series of seven sediment profiles around the castle landscape. The project was funded by the Arts and Humanities Research Council as part of the Parnassus Project, a multi-disciplinary study of the effects of climate on historic buildings (www.ucl.ac.uk/parnassus, accessed 25th April 2015). The profiles were brought to the laboratories at the University of Southampton and subjected to stratigraphic, palynological (pollen), and radiocarbon analysis by Rob Scaife. Two cores inside the castle (A1 & A2) span the occupation and abandonment horizons and the underlying, pre-castle, sediment. Five profiles outside of the castle include samples taken from sediment underlying the moat bank (D), a nearby pond (F), the overflow car park (B), and the site of a possible structure to the east of the castle (C1 & C2) (Fig. 5.1). These data have been combined with the results of other pollen studies to describe a vegetation and environmental history of the castle and its landscape, as it relates to human use and occupation of the site.

Sediment profiles are described in tables and represented in diagrams; the key to stratigraphic diagrams can be found in Fig. 5.2. For a detailed account of methods of sediment profile collection and analysis, refer to Appendix Three. The detailed technical report on the work has been lodged with English Heritage (Scaife & Copeland 2015).

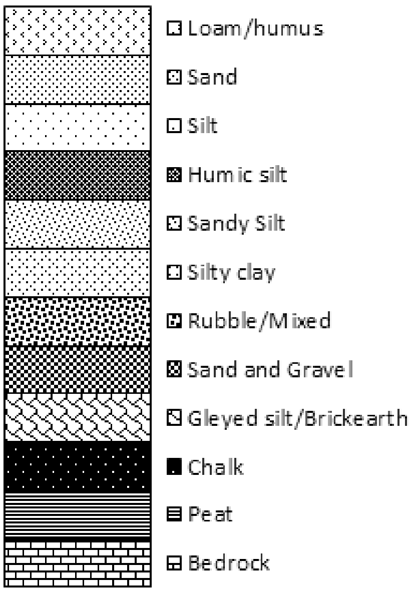


Fig. 5.2: Key to stratigraphic diagrams.

Fig. 5.3: Relative heights of the cores, facing east. Blue lines=Moat and pond; Green lines=Land east of the moat; Red lines=North and south moat banks. The creation of an artificial raised floor beneath the castle is suggested by comparison to the lower ground directly east (green).

Inside the Castle: Profiles A1 and A2

On 8th May 2013, researchers from the University of Southampton were on site at Bodiam in the early morning hours to complete coring inside the castle before it opened for visitors. With the help of National Trust staff, drains and connecting pipes were avoided, and recently-laid gravel was brushed aside to begin coring at a stable ground surface.

We planned to sample sediments from the eastern side of the castle to investigate the origins of the castle platform. Was the castle constructed on an existing ground surface, or had sediment been brought in to create the castle foundation? The 'half-basement' level along the eastern range of the castle was chosen to test this question, because underneath a basement any built-up ground to create a platform should be shallow enough that a core could completely penetrate it, reaching into the presumed *in situ* soil beneath. We were also looking for any evidence of habitation prior to the castle's construction, to understand the long-term human use of the Bodiam landscape and to address whether existing hydrology might have contributed to the choice of this particular spot for the construction of the castle and moat. Two cores were collected in this area, one in the northern range and one in the eastern range, just north of the door to the south-eastern tower (Figs 5.1 & 5.3).

Profile A1: Pollen analysis

Sample A1 was located in the eastern corner of the northern range. The sediment was a fine, inorganic marl, likely from a freshwater, spring-fed (lacustrine) basin. The core was not retained for stratigraphic analysis, though some evidence of floor preparation was observed prior to discarding the sediment (see below, Profile A2). Two spot samples for pollen analysis were collected at depths of 130 cm and 160 cm, most likely predating the castle and of post-Roman date, both of which showed evidence of woodlands, wetlands, and agriculture in varying proportions (Table 5.A).

The upper sample (130 cm) includes a single but important occurrence of walnut (*Juglans regia*)[2]. Walnut was a Roman introduction to Europe as a whole, and in England it has been increasingly recovered from Romano-British and later sites (Scaife 2000; 2004). Walnut is therefore a useful biostratigraphic marker of Roman or post-Roman presence, and dates the sediment at 130 cm to a Roman or later period. The lower sediment, at 160 cm, is less easily dated, but may predate a Roman presence in the area.

Oak (*Quercus*) and hazel (*Corylus avellana* type) are the dominant tree taxa from both samples. The landscape of Bodiam probably supported substantial oak and hazel on local well-drained soils throughout the pre- and post-Roman periods. This woodland is likely to have been managed for timber and coppice (Rackham 1986; 1990).

Trees and shrubs from the upper sample also include small numbers of birch (*Betula*) and beech (*Fagus sylvatica*). The relatively small amount of birch in the sample suggests that birch trees may not have been present in the immediate vicinity, because birch trees produce a large amount of pollen that can move significant distances with the wind. Beech, in contrast, is poorly represented in pollen assemblages unless the sample site is close to the tree canopy (Andersen 1970; 1973); therefore, beech was probably growing locally but not immediately on the site during the later, post-Roman period.

The higher pollen numbers of alder (*Alnus glutinosa*) in the upper sample suggest that there was an area of wetlands, possibly near a spring, on or very close to the site during the later post-Roman period. High values of both polypody fern (*Polypodium vulgare*) and wood fern (monolete *Dryopteris*) spores present in

2 Scientific names are included in parentheses following the first use. Thereafter, common names are employed for ease of reading. See Appendix Two for a chart of common and scientific names of encountered flora.

Table 5.A: Pollen count data from Profile A1 (north-eastern corner, castle interior). This core was not retained for stratigraphic analysis; only two spot samples were collected for pollen analysis.

Depth	**1.30 m**	**1.60 m**
Trees & Shrubs		
Betula (birch)	16	1
Quercus (oak)	56	45
Fagus sylvatica (beech)	2	1
Juglans regia (walnut)	1	-
Corylus avellana type (hazel)	62	72
Erica (heather)		1
Herbs		
Poaceae (Grass family)	74	100
Cereal type	10	39
Large Poaceae (non-cereal)	1	-
Secale cereal (rye)	-	9
Ranunculaceae (Buttercup family)	-	1
Ranunculus type (buttercup)	1	-
Sinapis type (mustard)	-	1
Caryophyllaceae (Carnation family)		
Dianthus type (carnation genus)	-	11
Cerastium type (chickweed)	1	1
Chenopodiaceae (Goosefoot family)	-	1
Lysimachia (loosestrife)	-	11
Plantago lanceolata (ribwort plantain)	4	1
Succisa type	1	-
Asteraceae (Daisy family)	-	-
Bidens type (beggarticks)	-	4
Anthemis type (chamomile)	9	-
Artemisia (wormwood genus)	-	1
Centaurea nigra type (knapweed)	-	9
Centaurea scabiosa type (greater knapweed)	-	5
Lactucoideae (dandelion & lettuce subfamily)	11	21
Unidentified	-	2
Wetland		
Alnus glutinosa (alder)	155	67
Typha angustifolia type (cattail)	3	1
Cyperaceae (Sedge family)	5	11
Sphagnum (peat moss)	-	1
Ferns		
Pteridium aquilinum (bracken fern)	43	143
Dryopteris type (wood fern)	47	102
Polypodium vulgare (polypody fern)	5	47

the lower sample may be associated with this nearby alder woodland. High counts of bracken (*Pteridium aquilinum*) suggest local waste ground on the acid sandy soils that are typical of the region.

In addition to woodlands, both well drained and wet, there is also strong evidence for arable agriculture. Cereal pollen numbers are especially high in the lower (earlier) sample from 160 cm. The herbaceous diversity is also greater in this older sample. Grass (*Poaceae*) pollen with dandelion type (*Lactucoideae*) are evidence of grassland, possibly pasture, at this time. It is probable that a mixed agricultural economy with areas of woodland management existed during roughly the pre-Roman period. The upper sample appears to show some reduction in arable and an expansion of woodland in the post-Roman period, with increased hazel, possibly indicating the secession of arable ground into woodland.

Profile A2

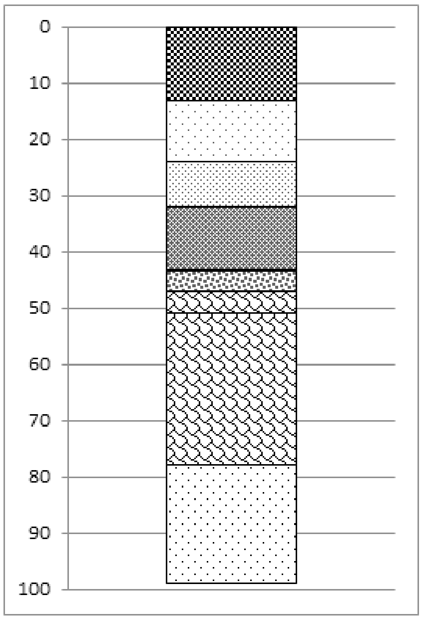
Profile A2 was obtained in the eastern range, just north of the door to the south-eastern tower (Figs 5.1 & 5.3). Here, we observed a well-defined occupation horizon, consisting of dark, humic, charcoal-rich sediment overlying what appeared to be a chalk floor (Table 5.B). This possible anthropogenic horizon had also been observed in Profile A1, albeit less clearly.

The meter-deep stratigraphic sequence from Profile A2 begins with a dark humic occupation horizon, including sand and silt with some charcoal fragments from 0-43 cm, possibly preparation for the grass surface laid down by Curzon in the 1920s. This overlies a well-defined anthropogenic horizon of distinct chalky rubble above puddle chalk and pebbles (43-47 cm). Beneath this layer, gleyed and oxidised alluvial silts (brickearth) extend from 47 cm to the end of the core at 99 cm.

The chalk horizon in sample A2 is a chalk rubble layer. The architectural evidence suggests that this is floor preparation. A flagstone floor above the chalk is a strong possibility, although there are no surviving original ground floor surfaces in the castle for comparison. The height of the top of the core is approximately the same as the top of the chamfer stops on the east tower door frame, about 43 cm above the chalk horizon. If we assume that the distance between the chamfer stops and the floor was the same as on all other stories, the floor should be about 30-35 cm (depending on weathering) below the chamfer stops (and modern ground surface). The chalk horizon is instead 43 cm below the surface, or about 10 cm deeper than expected for a floor surface (Fig. 5.4). The chalky rubble horizon probably

Table 5.B: Stratigraphy of Profile A2.

Depth cm	Stratigraphy
0 - 13	Contemporary surface. Sand and sharp gravel.
13 - 24	Silt, fine and medium texture, grey-brown. Grey (10YR 4/2)[1] becoming greyer at base. Some buff coloured inclusions. Sharp boundary at base.
24 - 32	Sand, pale yellow, fine texture (10YR 8/8).
32 - 43	Probable occupation layer: charcoal inclusions and some mixed humic fill. Silt, fine and medium texture, dark grey (10YR 2/1 to 2/2). Pebble at base (43 mm diameter).
43 - 43.5	Chalky rubble layer. Likely preparation for a (now removed) stone floor.
43.5 - 47	Disturbed gritty layer. Sand, silt, chalk mottling, and small stones (to 10 mm diameter).
47 - 51	Brickearth. Pale at top becoming darker in lower context.
51 - 78	Silt, grey (10YR 5/8) to pale brown. Mottled, possibly gleyed, with oxidised rootlet channels. Calcareous inclusions at 72-73 cm.
76 - 77	Iron staining.
77 - 99	Silt, slightly finer, darker grey (10YR 5/6) than above. May be less gleyed.



1 Munsell soil colour description. Used throughout.

represents packing underneath a finished, durable floor surface. Ten centimetres of cobbles or flagstones atop the chalk would have raised the castle floor above the water level of the moat, which is currently only about 3 cm higher than the chalk horizon.

These findings are consistent with Lord Curzon's observation of a 'floor' in the south-west corner tower under the water level (Curzon 1926: 134). Curzon suggested that the level of the moat had changed. However, given the evidence from the level of thresholds and doorframe chamfers, a large change in the moat level is unlikely. Rather, the floor Curzon observed was most likely originally underlay for a substantial layer of stone slabs or cobbles c. 10 cm or more thick, raising the functional floor above the moat level. Such a floor would have been substantial enough to be worth money when stripped out in the 17th century, when many parts of the castle were torn down and repurposed (Johnson *et al.* 2000: 38).

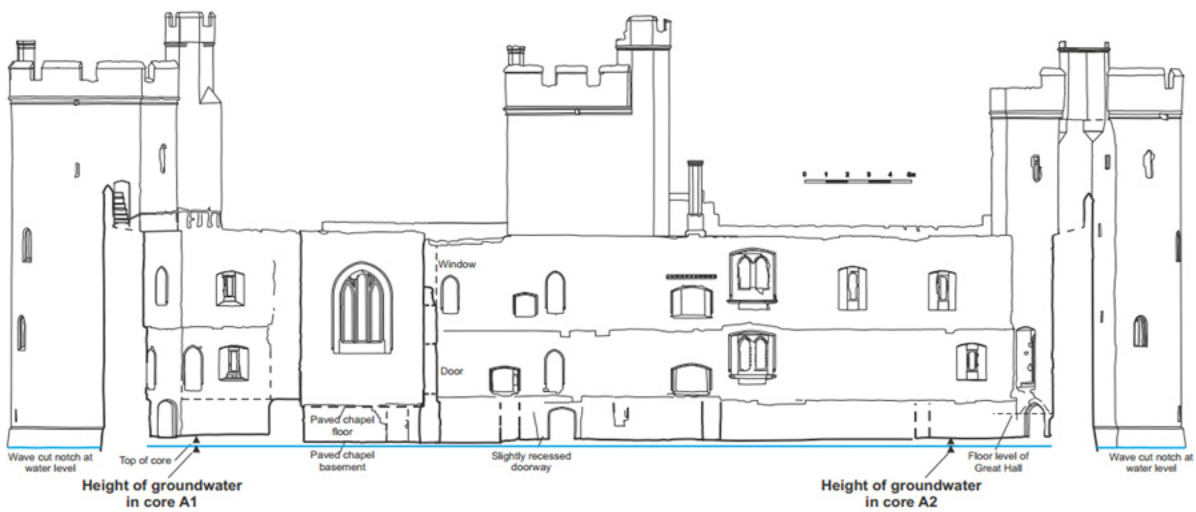


Fig. 5.4: East range of castle, showing core locations relative to the groundwater level. Groundwater is c. 20 cm below the basement floor level. (The slight difference between the water level of the moat and groundwater below the castle is likely due to the fact that the interior and exterior surveys took place months apart, and water levels can fluctuate throughout the year.)

Ground Penetrating Radar (GPR) carried out inside the castle in February of 2016 shows a few reflectors in the south-east corner at a depth of approximately 40-90 cm (Chapter Three, Fig. 3.8, this volume). These may correspond to the chalky rubble observed in core A2. Reflectors at approximately 40-80 cm in the north-east corner may also correspond to similar structures observed in core A1.

Profile A2 pollen analysis

Pollen was analysed at alternate 2 cm intervals through the anthropogenic/occupation horizon, between 32-45 cm (Fig. 5.5). The pollen spectra obtained are generally similar throughout the profile, but there are some minor differences above and below 38 cm. This difference may signify an occupation horizon, but could also represent the phase of castle abandonment that began c. 1643 and continued through the early 19th century. The lower part of this deposit, from 39-43 cm, contains pre-Quaternary fossilised pollen, which suggests that the silt above the chalk is a secondary deposit that was moved inside the castle from elsewhere, possibly from flooding, or perhaps as an intentional living surface. A flooding event could easily have followed the removal of thick flagstones, corresponding to site abandonment. This silt tails off in a more humic upper horizon above 37 cm, possibly a sign of early post-medieval occupation or related to more recent landscape work to maintain the modern grass surface.

The pollen and spores deposited within the castle include pollen that primarily came from plants growing in the immediate vicinity of the castle walls, as well as pollen derived from secondary sources such as domestic waste. Tree and shrub pollen come largely from wind-pollinated taxa, which generally produce more pollen, and will have travelled from outside the castle. These taxa include primarily oak, hazel, and alder, as well as smaller amounts of birch, pine (*Pinus*), and occasional elm (*Ulmus*) and hornbeam (*Carpinus betulus*). Lime[3] (*Tilia cordata*) and spindle (*Euonymous*) are present, and because these taxa are usually less well represented in pollen assemblages, they are likely to have grown within the castle grounds.

The high levels of grass pollen and cereals are typical of anthropogenic deposits. Grassland and pasture taxa also include ribwort plantain (*Plantago lanceolata*), dandelion, and knapweeds (*Centaurea* spp.). This grassland pollen may derive from pastures exterior to the castle, but it could also come from secondary sources such as floor covering, thatch, or domestic waste. Cereals are most likely to come from secondary sources such as crop processing and resultant debris, waste food and faecal material, or straw used as floor covering. Small numbers of sedges (*Cyperaceae*), reed mace/cattails (*Typha angustifolia*), bur-reed (*Sparganium*), and occasional other wetland types, may be of similar secondary origin or could have grown in the moat.

Ivy (*Hedera helix*) and polypody fern spores were also common in the pollen assemblage, suggesting that these may have been growing along the inner walls of the castle after abandonment, consistent with 18th-century watercolours of the castle interior (Fig. 5.6).

The Mill Pond/'Tiltyard': Profile B

A profile was obtained from the overflow car park (Fig. 5.1), which was not in use for parking the day of the fieldwork. Lord Curzon (1926) called this area the 'tiltyard', but it was almost certainly a mill pond during the medieval period. The core was placed not far from the location of a harbour, marked as 'the wharf' in Fig. 5.1, dating from the medieval period and earlier (Priestley-Bell & Pope 2009). We intended to use this core, first, to assess the origin and development of the mill pond as it related to the castle and second, to address silting of the former harbour area and the economic relationship between the castle and the river. Thanks to recent geophysical work also performed by the University of Southampton (Chapter Four, this volume), we were able to avoid coring through drainage channels and overburden left from work performed by Curzon in the 1920s.

Peat appears at 96 cm below the current surface and continues beyond 1 m (the depth of the core) (Table 5.C). The peat is capped by a transitional layer of humic clay-silt, below brown-grey, gleyed, silty brickearth sediment that continues to the modern surface. A radiocarbon date of cal. 2455-2200 BCE (calibrated *Beta*-382481; measured as 3840+/-30BP) has been obtained from an alder twig at 98-96 cm, within the top of the peat. The stratigraphy therefore shows a progressive transition from a stable peat-forming habitat during the late Neolithic, through wetter fen conditions, and finally to alluvial sedimentation. This is consistent with peat previously observed in this area at 2-4 m depth (Barber 1998).

Pollen analysis

Pollen analysis was performed at 0.05 m intervals on the lower, wetter, and more humic sediments from 60-100 cm, consisting of detrital peat below humic, laminated silt. The gleyed sediments above 60 cm

3 Tilia cordata is known as linden in some parts of the world. We follow UK standard taxonomy and refer to tilia as lime.

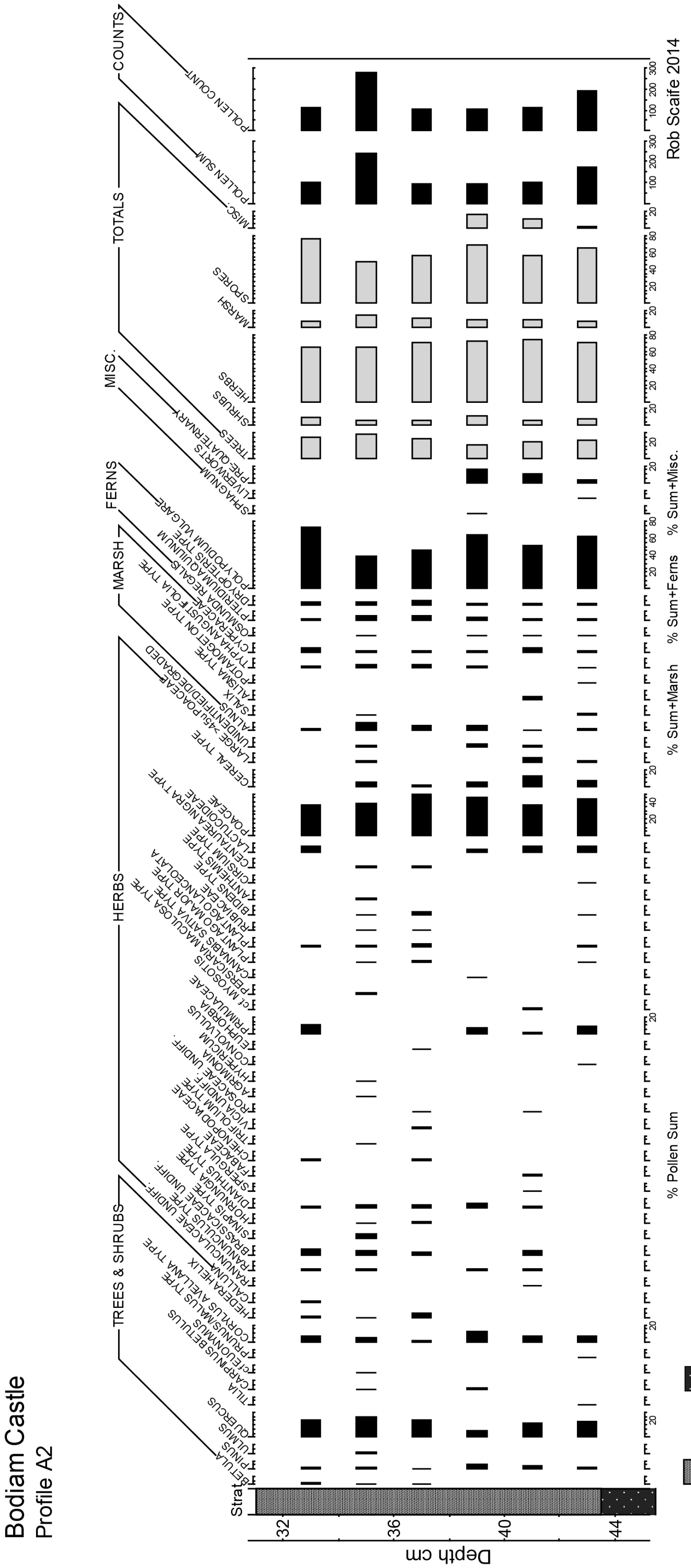


Fig. 5.5: Pollen diagram from Profile A2.

Fig. 5.6: 'A colored view of the interior of the east side of Bodiham Castle; drawn by S.H. Grimm, in 1784'. Note the ivy and ferns growing along the castle walls. © The British Library Board, Add.5670 f10 (no.18).

were deemed too oxidised to produce reliable pollen counts. The pollen profile is homogeneous with few changes in the pollen spectra over time (Fig. 5.7).

The column contained a diverse range of tree and shrub pollen throughout the sequence. Oak and hazel were the most common, with some lime, pine, birch, ash (*Fraxinus*), beech, holly (*Ilex*), viburnum (*Viburnum*), buckthorn (*Rhamnus cathartica*), willow (*Salix*), and alder buckthorn (*Frangula alnus*). Smaller amounts of herbs and ferns, including grasses, cereals, and weeds also appear throughout – including, interestingly, a single instance of hemp (*Cannabis sativa*) pollen just above the peat transition. These generally consistent proportions suggest that the local terrestrial, dryland area changed little in woody and herbaceous character over the time period investigated, and included some degree of arable cultivation at a distance from the sample site.

In contrast, on-site wetland taxa experienced a shift in proportions over time. Similar to the north-eastern pond (Profile F), Profile B contained very high values of alder (99%) at the base, decreasing to 40% by the top of the sampled section. Meanwhile, sedge, water plantain (*Alisma plantago-aquatica*), iris (*Iris*), cattails, and wetland fern taxa become increasingly prominent, suggesting a shift from a wet, boggy depression dominated by alder woodland into open water.

This evidence is entirely consistent with the presence of a mill pond, though not conclusive. There is no evidence of water lilies or other aquaphiles here. However, mill ponds are periodically cleared and constantly in motion when in use, which reduces the potential for pollen preservation. The shallow depth of the peat, along with data from the topographic survey (Chapter Four, this volume), suggests that the mill pond during the medieval period was probably relatively shallow. A mill under these circumstances would necessarily have employed an undershot wheel.

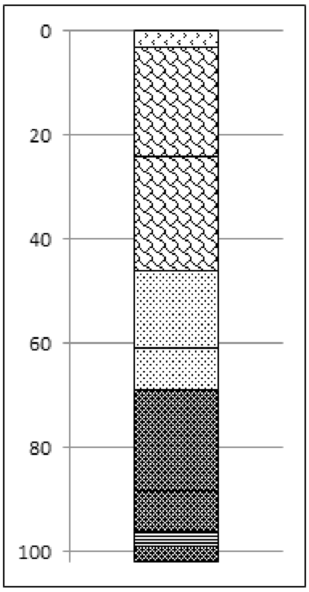
The radiocarbon date places the transition from alder fen carr peat to alluvial sediment in the middle of third millennium BCE, similar to dates obtained from peat elsewhere in the Bodiam landscape (Priestley-Bell & Pope 2009). The change appears to have been gradual, although some kind of destabilising event (possibly intensified land use) occurred in the late Neolithic or early Bronze Age. This event changed a stable peat-forming habitat to one dominated by soil erosion, transport, and deposition, possibly a floodplain.

Cattle or Mill Yard? Profiles C1 and C2

Two core profiles were obtained from this grassy area just to the south-east of the castle. As discussed in the previous chapter, geophysical survey suggested that a structure once stood in this corner of the property. Our initial suggestion was that this was a possible mill site given its relationship to existing ponds and ditches, but other evidence places the mill to the south-west of the castle (Chapter Four). We placed cores along linear anomalies evident in the geophysical results that had been identified as possible building foundations, next to or over water channels (Fig. 5.1). We were looking for low-lying silts beneath demolition debris. We were also on the alert for deep deposits that might represent a wheel pit, or any stratigraphic evidence for flowing fresh water, cereal cultivation, or waterlogged wood, any of which would suggest the operation of a

Table 5.C: Stratigraphy of Profile B.

Depth cm	Stratigraphy
0 - 3	Contemporary soil.
3 - 24	Fine-medium gleyed grey-brown silt (brickearth) (10YR 5/5 to 5/6). Some clay content.
24 - 46	Silt, grey (10YR 6/2). Gley with iron staining. Oxidised plant rootlets (especially 40-45 cm).
46 - 61	Clay and fine silt (10YR 6/2). Pale and diffuse mottling (10YR 6/8); greyer and wetter downwards. Oxidised rootlets.
61 - 69	Transitional context between humic silt (below) and brickearth (above). Pale brown to grey clay-silt with occasional charcoal specks.
69 - 88.5	Organic/humic silt, fibrous, coarsely laminated (10YR 3/1 to 4/1).
88.5 - 96	Humic silt with small plant inclusions, e.g. stems. Wood at 96-98 cm.
96 - 99	Dark grey-black peat (10YR 2/1 to 10YR 2/2).
99 - 102	Laminated, humic silt at base.



mill. However, instead, the cores suggest that the area has a long history of use as pasture with little sign of disturbance; the area as a whole may well have been a water meadow at some point. The shift to pasture likely occurred well before the medieval period, and it is more probable that the resistivity results are showing a cattle yard or byre complex. The anomalies could also reflect more recent upcast from moat excavations or clearing of drainage ditches. Excavation would be needed to confirm either interpretation.

Stratigraphically, the two profiles are very similar, as expected given their proximity. The 1 m profiles both had silty peat at their base, extending below the end of the core, overlaid by a transition from alluvial grey silt up to the modern soil horizon, including a thick layer of mature pasture soil (Tables 5.D & 5.E).

Pollen analysis

Because both profiles are stratigraphically similar, only one was examined for pollen and spores (C1; Fig. 5.8). Analysis again concentrated on the better-preserved peat and the transition into overlying alluvium (88-105 cm below the surface). The environment and vegetation significantly changed at around 99 cm depth, from an earlier alder carr woodland with peat accumulation, to an open herb fen, including a possible intermediate stage of wet fen with sedges.

The lower part of the profile (within the peat), from c. 99-104 cm, is dominated by trees and shrubs, particularly alder pollen (80%), significant proportions of oak (40%) and hazel (48%), and some few examples of lime and ash. Like other profiles, this suggests terrestrial oak and hazel woodland in the nearby vicinity, with wetter alder woodland directly on site. Some few grasses (3%) and a single grain of cereal pollen appear at this depth, along with multiple taxa of fern spores. Some wetland taxa are present at this level, including sedges such as cattails and water plantains.

The higher zone, silty soils from c. 88-99 cm, is defined by a reduction in the proportion of trees and shrubs, and a corresponding increase in herbs and wetland taxa. This opening of the pollen catchment may be due to woodland clearance, which may also be responsible for the change from a stable peat-forming regime to a more dynamic riverine environment. Sedges and ferns are present at higher proportions at the base of this section of the profile, declining higher in the section (88 cm). The proportion of grass pollen rises to 78% at the later time, with other herbs including ribwort plantain and small numbers of cereals. This increase suggests pastoral and arable agriculture in the near vicinity, perhaps on site, though it could also be the result of fluvial or aerial transport from more distant sources, or autochthonous, non-cultivated grassland. The high proportion of grass pollen together with the well-developed soil observed in the stratigraphic profile suggest that the earlier wetland was succeeded by very good pasture land, of a sort that generally takes hundreds of years to accumulate.

The Moat Bank: Profile D

Core D, located in the southern bank of the moat (Fig. 5.1), was obtained mid-morning while the castle grounds had few visitors. The core was placed just off the

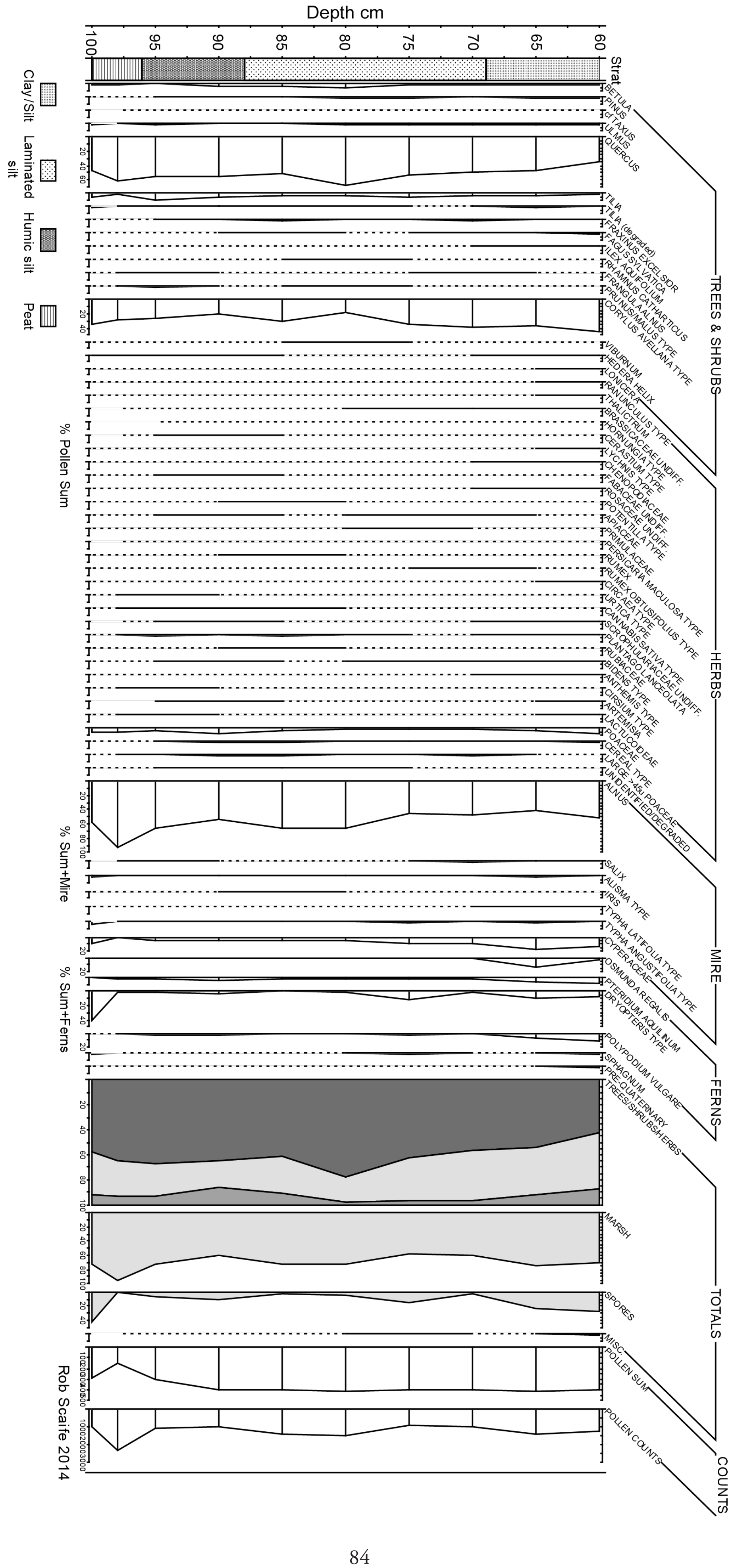
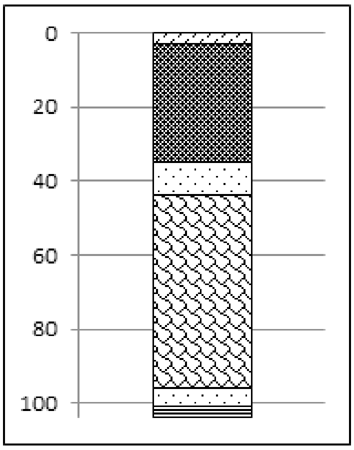


Fig. 5.7: Pollen diagram from Profile B.

Table 5.D: Stratigraphy of Profile C1.

Depth cm	***Stratigraphy***
0 - 3	Contemporary surface.
3 - 35	Thick, humic pasture soil. Fine sandy silt (10YR 5/6). Crumbly texture.
35 - 44	Finer and more compacted silty sub-soil. Pale grey band of medium silt c. 46-47 cm.
44 - 96	Gleyed brickearth (fine silt and clay), pale grey/buff brown (10YR 6/4). Iron mottling with oxidised rootlets. Silty clay towards base (homogeneous pale grey) (10YR 6/2 or 6/3).
96 - 01	Silt, darker grey with pale brown mottling. Wood fragment at 99 cm (probable modern root).
101 - 104	Humic silty peat, dark grey (10YR 4/2).



edge of the gravelled path on a grass surface (Fig. 5.9). We planned to assess whether excavated soil from the moat had been redeposited to create the bank, possibly manifesting as a clear division between a paleo soil and a layer of dumped fill. Lacking such a divide, we might have been able to suggest that earlier buildings were present on the site prior to the castle construction.

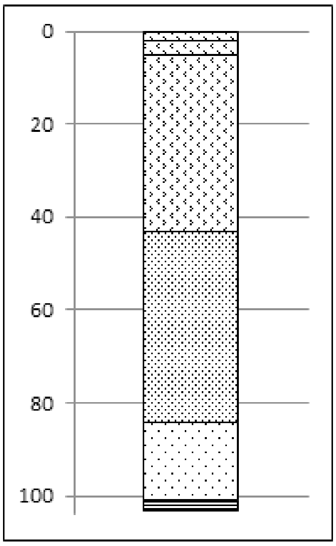
This profile is the deepest we obtained at Bodiam, with sediments to bedrock at 320 cm (Table 5.F). We tentatively identified a land surface at 88 to 93 cm below the modern surface. This is higher than expected for a natural land surface, which might be expected to slope gently towards the river at this point. The ground to the south of the moat therefore tentatively appears to have been sculpted to create a higher bank than was necessary, perhaps by layering dredged clay from the moat atop an existing scarp, or by cutting away soil to the south of the bank. This might also have had the effect of enlarging the mill pond.

The upper sediment consists largely of gleyed silt (brickearth) with sand lenses, possibly material built up during later additions to the moat bank. Below the possible land surface is a series of coarse-textured, silty marls, overlying lower, non-oxidised, grey silt, atop the bedrock.

These results are consistent with the moat bank section that was exposed next to the postern gate bridge abutment during alterations to the bank in 1995 (Stevens 1999), not far from our Profile D. This earlier work also showed a possible sloping surface at c. 1 m below the present ground surface, interpreted as the original 14th-century moat bank, with heightening of the bank tentatively dated via ceramic sherds to the 15th century. In contrast, sections of the north and west moat banks have shown no evidence of artificial construction (Barber 2007b). The moat appears to have been cut into the slope of the valley on the north and west, and artificially banked to the south and east, to create a level basin (see Fig. 5.3).

Table 5.E: Stratigraphy of Profile C2.

Depth cm	***Stratigraphy***
0 - 2	Contemporary surface.
2 - 5	Brown, well-sorted sub-soil. Probable worm action.
5 - 43	Thick, humic, sandy, mature pasture soil. Well-developed crumb structure. Many monocotyledonous roots.
43 - 84	Gleyed silty clay, pale grey and pale brown. Oxidised iron stains, possible roots. Some magnesium staining (esp. 84-86 cm).
84 - 101	Mottled silt, pale brown (10YR 3/3) and pale grey (10YR 6/1). Oxidised root stains. Sharp transition at base.
101 - 103	Humic silty peat. Black oxidised detrital with wood fragment.



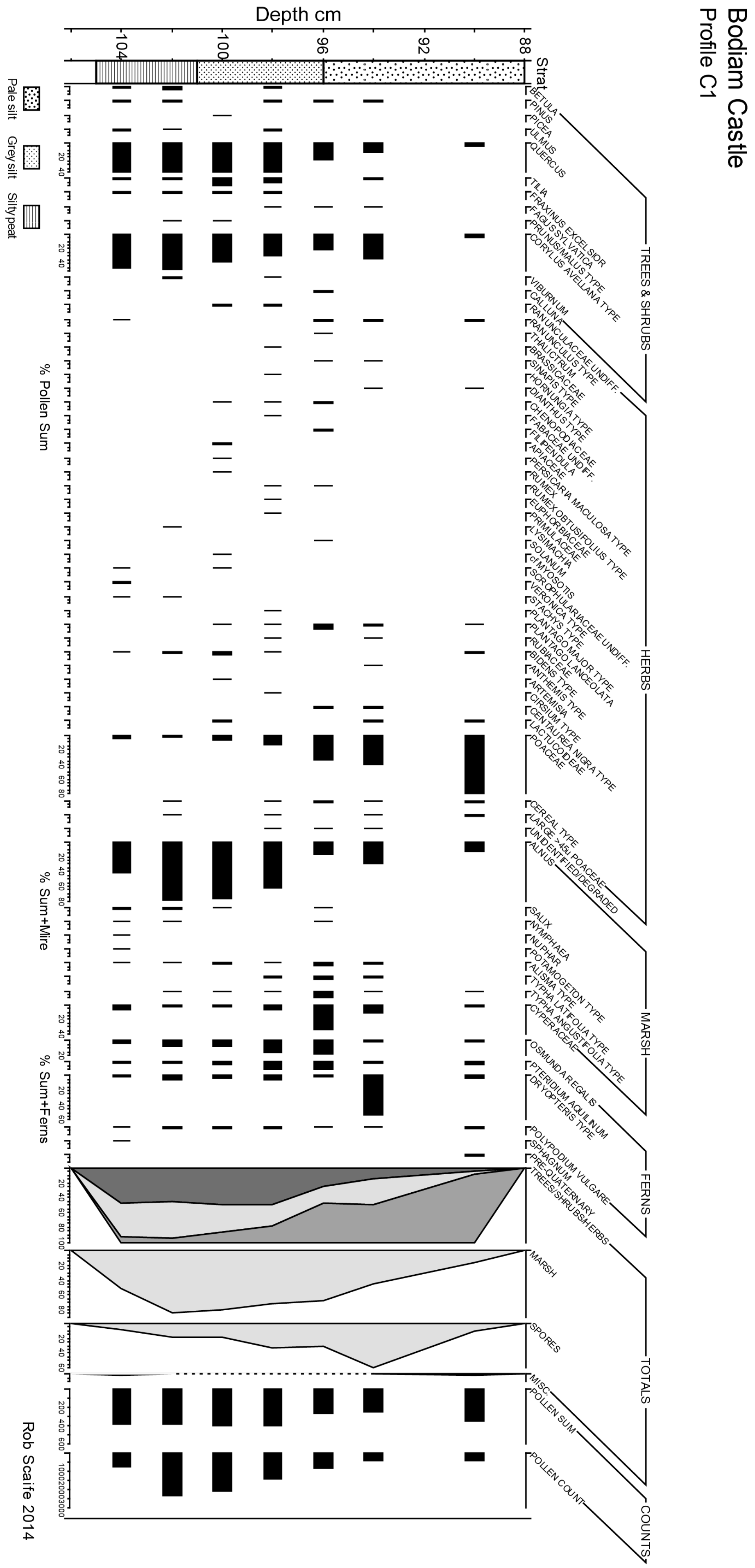


Fig. 5.8: Pollen diagram for Profile C1.

Pollen analysis

Pollen could only be recovered from the lower, waterlogged, grey silty sediments, c. 2.86-3.20 m below the surface (Fig. 5.10). The oxidised and gleyed character of higher sediments resulted in very poor pollen preservation.

The lower zone, from c. 300-320 cm, suggests a watery habitat, perhaps a marginal aquatic fringe to a local alluvial or spring-fed wetland, with both alder fen carr and hazel woodland nearby. The assemblage is dominated by diverse woodland taxa, probably originating at a slight remove from the sample site. These include high values of hazel and alder, with some oak, birch, holly, and lime, and occasional pine, maple (*Acer*), and elm as well as ivy, viburnum, and willow. Herbs, especially grasses, are present in small numbers, with some ribwort plantain, chickweed (*Caryophyllaceaea cerastium*) and related species, and assorted flowering herbs (*Asteraceae*). There is also a small amount of sedges, including cattails, and some ferns, especially royal fern (*Osmunda regalis*) near the base of the section.

In the higher zone, from c. 286-300 cm, local conditions became wetter, and the fringing woodland declined or moved farther away from the sample site, likely giving way to pasture. Grasses are dominant, along with some cereals, ribwort plantain, hemp, and other pastoral and arable herbs. Woodland taxa include significantly lower amounts of hazel and alder pollen than in the lower zone, but oak increases near the top of the section. Sedges, cattails, and ferns are also reduced, though there is a single example of water-lily pollen (*Nymphaea alba*).

Fig. 5.9: James Miles, Dominic Barker, and Victoria Stevenson coring on the south bank of the moat (Core D in progress). Photo by Penny Copeland.

The East Pond: Profile F

Core F was obtained on the northern edge of the present small pond, located to the east of the moat (Fig. 5.1). While the castle was in use, the pond might have held fish, or served as a headwater pond for the mill, constrained movement around the castle, or most likely some combination of all three. This area has also been used several times as a dumping area for residue when the moat was dredged over the course of the 20th century (Johnson *et al.* 2000).

Though the area is currently vegetated wetland, we hoped that analysis of the underlying silt and pollen would suggest when and how the pond was constructed and used. The profile demonstrates that the pond existed during the whole history of the castle, and was almost certainly wetland before it became a pond.

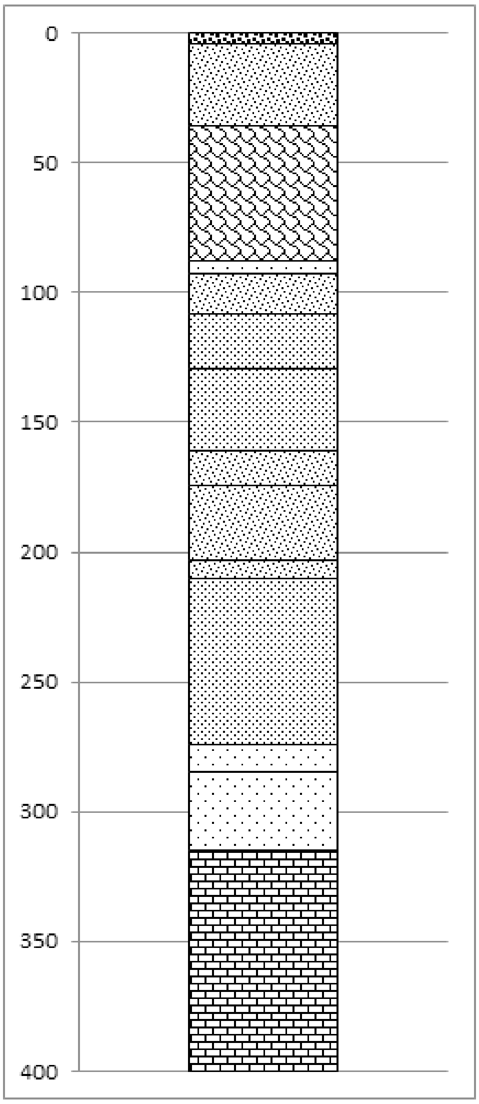
This site had a 2 m thick, continuous sequence of largely humic mineral sediment and some peat (Table 5.G; Fig. 5.11). The very thick, undisturbed sediments under a layer of compacted leaves at c. 60 cm suggest that the area has been a pond for a considerable time. Above c. 60 cm, the stratigraphy consists of sand, gravel, and other dumped material. A radiocarbon measurement from a wood twig at 118 cm provided a date of 130+/-BP. This date can be calibrated to either 1670-1780, or to 1800-1950 (the calibration curve has two peaks at this point). The former date, close to the abandonment of the castle, is much more likely given the stratigraphic location of the sample. The 50-60 cm of structured sediments between this twig and the fill material suggests that the pond was undisturbed for many years after the castle's abandonment, before it began to see use as a dumping ground in conjunction with the landscape work of the 19th and 20th centuries.

Pollen analysis

Pollen analysis was only performed in the more structured sediments below 60 cm. There is a distinct division between the pollen assemblages above and below c. 1.70 m (Figs 5.11 & 5.12). The stratigraphy is very similar on either side of this divide, so it is probable that this small pond remained similar in form and structure over time, despite changes to the fringing vegetation. In the earlier phase, alder was dominant on the site, with some hazel and oak and few grasses, algae, and ferns. This habitat later changed to an open pond with fen herb type vegetation, including willow, with higher amounts of oak and diverse grasses and cereals, and lower numbers of wetland taxa and alder.

Table 5.F: Stratigraphy of Profile D.

Depth cm	Stratigraphy
0 - 4	Gravel below contemporary turf.
4 - 36	Bank material. Fine, friable, sandy silt.
36 - 88	Bank material. Brickearth; gleyed orange/yellow/brown silt (10YR 5/6). Iron staining. Oxidised plant roots.
88 - 93	Possible old land surface. Greyer silt. Limestone fragments up to 20 mm in diameter.
93 - 108	Sandy silt, orange/grey/brown (10YR 5/6). Fine sand inclusions. Gleying and charcoal specks, c. 103 cm.
108 - 129	Fine pale yellow sand (10YR 7/6).
129 - 161	Fine pale brown/yellow sand. Fine silt clasts give an almost brechiated texture.
161 - 174	Greyer sandy silt, brechiated texture.
174 - 203	Pale brown/yellow sandy silt (10YR 7/8 to 7/6). Paly grey clasts/intrusions c. 188 cm.
203 - 210	Orange silty sand.
210 - 274	Pale white/yellow to orange/brown calcareous sand/marl. Coarse, brechiated texture. No visible organic content.
274 - 285	Greyer silt.
285 - 286	Specks of magnesium (possibly charcoal).
286 - 315	Medium grey homogeneous silt (10YR 4/1 to 5/1). Magnesium (or charcoal) specks.
315 - 400	Bedrock. Mottled pale grey very stiff, brechiated silt. Some clay and calcareous inclusions.



The pollen evidence suggests that this area changed from a muddy depression in the ground with ephemeral standing water, to a proper pond later in the investigated time period. Dense alder woodland may have used the available water within the damp basin, leaving little for the use of other taxa or to accumulate in a permanent body of water. After the alder declined, possibly through woodland clearance by humans, the basin became wetter and marginal aquatic plants arrived, including water plantain, sedges, and marsh marigold (*Caltha palustris*). Standing water at this later time is evidenced by the cysts (dormant spores) of the algae *Pediastrum*.

The decline of the alder woodland opened the pollen catchment, allowing windborne pollen from the surrounding dry land to fall into the newly formed pond. Lower amounts of oak and herb flora during the earlier pollen assemblage are probably due to the masking effect of the alder rather than a true absence of the taxa in the area (Tauber 1965; 1967). Oak and hornbeam appear to have been consistently present in the local and near regional landscape throughout the time-span represented by the sediment. This may be evidence of regional managed woodland during later periods, maintained for construction materials or as a hunting park.

There is considerable evidence for arable activity throughout the later pollen assemblage zone, as expected for the late medieval and early modern periods. Small numbers of either hemp or hop (*Humulus lupulus*) pollen are present between 100-120 cm, around the time of the dated twig (118 cm, mid-17th century). These could be due to native local growth, or to cultivation for either fibre or brewing; the taxa have similar pollen morphology and cannot be distinguished. Hemp was also seen in the pollen spectra from the car park (B) and moat bank (D), see above.

At the top of the profile, the change to silt and possible dumped fill material also shows interesting changes

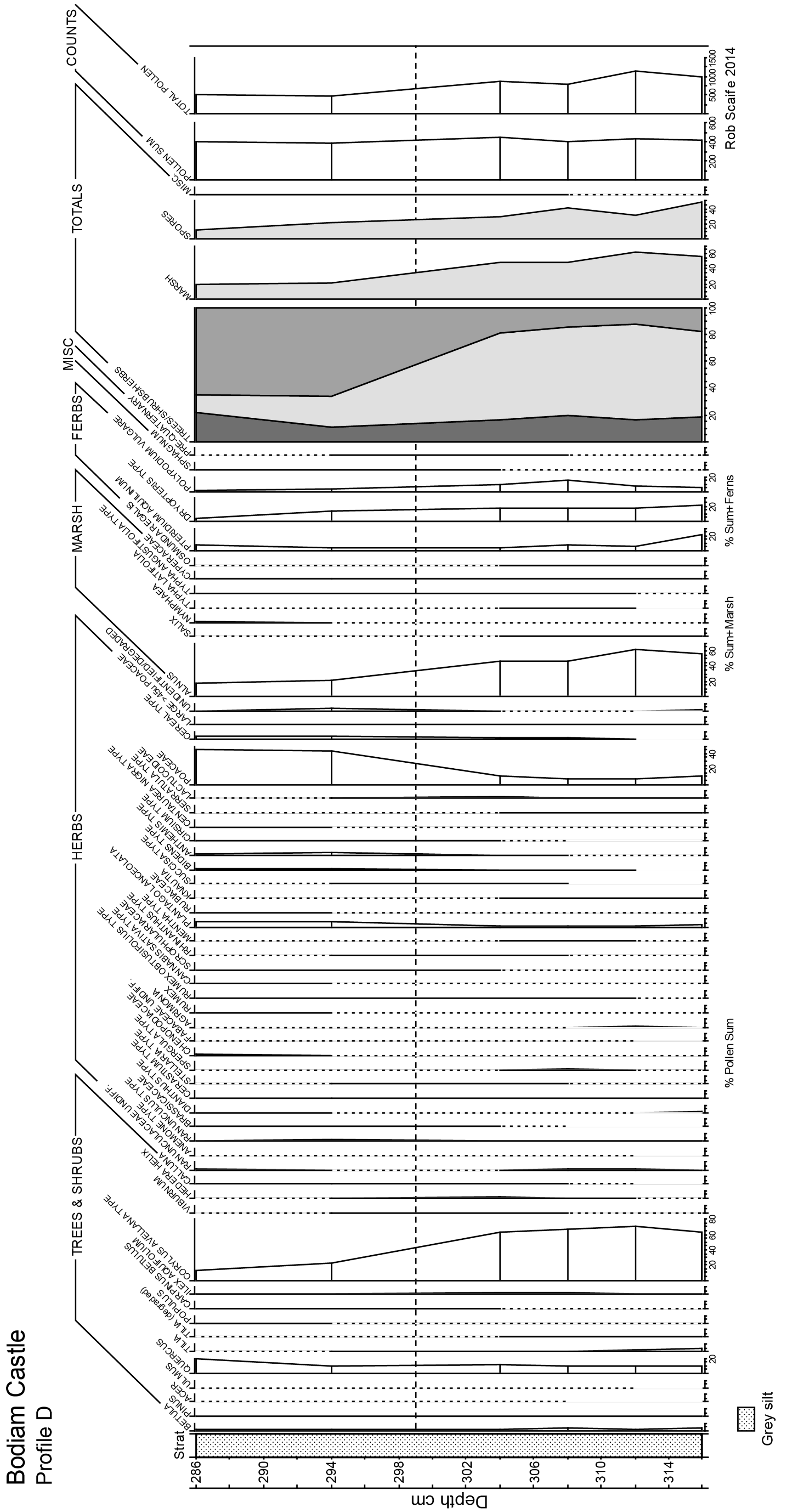


Fig. 5.10: Pollen profile of section D.

in the pollen. New taxa are probably associated with trees planted on the castle grounds by its more recent owners, including pine, spruce (*Picea*), lime, beech and holly. This expansion of pine and spruce may also provide a useful date marker for c. 1700-1750, as exotics (including reintroduced pine) were often planted in parks and gardens during this time.

Discussion

The landscape of Bodiam has a complex history and pattern of wetland activity and sediment types, spanning the late prehistoric to the post-medieval period. In general, the results provided here are consistent with previous work, which has shown the valley bottom near Bodiam to consist of layers of peat interspersed with alluvial sediments (see Chapter Two, this volume). Borehole work has suggested a V-shaped profile for the Rother valley near Bodiam, with more than 10 m of alluvial silt atop bedrock, upon which peat deposits have been deposited to a depth of up to 6 m deep in places (Fig. 2.4, this volume; Burrin & Scaife 1984; Burrin 1988). Previous pollen analysis of sediments from Robertsbridge also showed a similar pollen spectrum to those observed here at Bodiam (Chapter Two, this volume).

Until around the 3rd millennium BCE (the early Bronze Age), peat fens accrued in a stable environment of alder carr woodland, which had developed atop earlier alluvial sediments (Barber 1998; Priestley-Bell & Pope 2009). The environment then transitioned to one dominated by grey alluvial sediment (now gleyed, that is water-saturated and depleted of oxygen). The evidence presented here does not support a sudden, catastrophic change; rather, the pollen data supports a slow, continuous transition of increasing wetness, from alder woodland through wet fen and finally to alluvial floodplain (Priestley-Bell & Pope 2009).

Although there are documentary references to 'salt water' at Bodiam in the later Middle Ages (Chapter Two, this volume), there is no evidence of saltwater vegetation, salt marshes, or any other indication from the pollen assemblages that the sea ever extended inland to Bodiam, excepting perhaps occasional catastrophic flooding events that left little to no botanical trace.

Arable agriculture was present in the vicinity of Bodiam continuously from the Bronze Age through the present. This long-term evidence of arable might surprise the casual observer, as the prevailing image of the Weald is of heavy reliance on pastoral agriculture. These results remind us of two important facts. First, that most areas of preindustrial England featured a combination of arable and pastoral agriculture, even if there was a relative emphasis on one or the other that became more marked through time as market relations and regional specialisation deepened (Johnson 1996, chapter 2). Second, although some parts of the Wealden claylands may have been poorly drained and difficult to work, the Weald also provided fertile land that could be used for arable cultivation.

Prehistoric

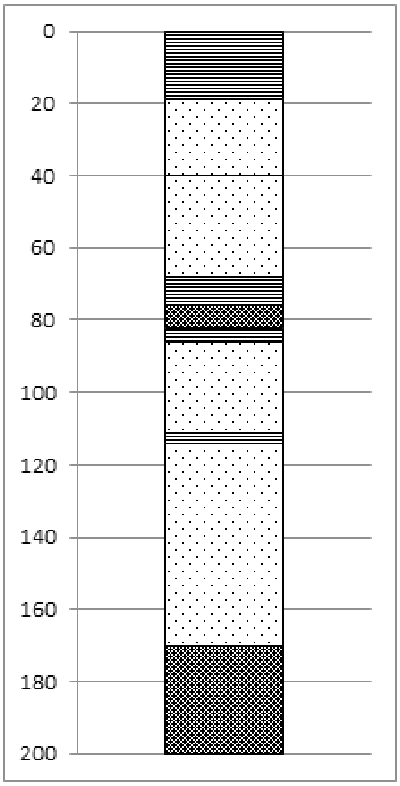
On well-drained soils, lime woodland was dominant in the region during the middle Holocene (c. 8000-1000 BCE, or the late Mesolithic, Neolithic, and early to middle Bronze Ages), in association with oak, elm, hazel, and other deciduous flora. Lime began to decline in many places during the late Neolithic (c. 2000 BCE) (Scaife 1980; 2000; 2004; Greig 1992; Waller 1993; 1994a; 1994b), perhaps due to either climatic changes or changes in human use of the landscape, such as increased agriculture (Godwin 1956; 1975; Turner 1962). A reduction in lime pollen such as we observed at Bodiam may in part have been due to expanding wetlands, as fen growth pushed well-drained land and associated flora away from the sample site (Waller 1994b). The decline of the lime woodland and expansion of alder carr wetland have been radiocarbon dated to the early Bronze Age at Bodiam (2050-1730 BCE and 2500-2518 BCE (Barber 1998); 2455 BCE (this study)), and both could have been consequences of human activity, including woodland clearance.

Climatic elements that could have influenced a shift towards wetter conditions include post-glacial sea level increase, which could have pushed freshwater streams back, leading to waterlogging upstream and the development of ponds. Though these effects have been documented elsewhere in England (Long 1992; Long

Fig. 5.11: The lowest 50 cm of Core F, in the east pond.

Table 5.G: Stratigraphy of Profile F.

Depth cm	***Stratigraphy***
0 - 19	Grey-brown peat. Plant remains (monocotyledons).
19 - 40	Grey silt (10YR 5/1). Gleyed (10YR 6/4). Occasional pebbles. Small twig at 35 cm.
40 - 68	Grey silt (10YR 5/1) becoming paler (10YR 4/1 to 6/2). Flint gravel rounded, subangular pebbles (up to 20 mm diameter). Compacted leaf fragments at 60 cm.
68 - 76	Black peat (10YR 2/1 to 2/2).
76 - 82	Brown-grey humic silt (10YR 4/2).
82 - 86	Peat with wood fragments.
86 - 111	Grey silt (10YR 4/2). Pebbles (up to 25 mm diameter) lower down.
111 - 114	Dark, humic peat.
114 - 170	Pale grey silt (10YR 5/1), oxidising to pale brown (10YR 5/4). Possibly freshwater environment. Magnesium mottling in places. Stone at 160 cm.
170 - 200	Brown, increasingly humic silt (10YR 3/2). Lenses of fine pale grey silt. No visible organic content.



& Innes 1993; Long & Scaife 1995; Waller *et al.* 1988; Sidell *et al.* 2000; Wilkinson *et al.* 2000), the changes at Bodiam seem to have occurred significantly later than the glacial retreat and corresponding sea level rise (c. 10000 BCE). Human impact, especially clearance of lime for agricultural expansion during the Bronze Age (c. 2500-700 BCE), would have caused a reduction in local evapotranspiration, leading to a higher water table and increased surface runoff. The overall result would have been a wetter local environment, changing the on-site mire from alder carr to wet herb fen, as observed in the pollen data.

Late Prehistoric and Early Roman

From the Neolithic through the middle Bronze Age, woodland and peat bogs dominated the deeper valleys and steeper hillsides. This period of stability came to an end in the middle Bronze Age (c. 1500-1000 BCE) when the landscape changed to grassland floodplain with seasonal alluvial sedimentation from the overflowing riverbank (Burrin 1981). The change was due to a combination of deforestation, sea level changes, and climatic shifts, but the primary cause appears to have been increased woodland clearance by humans, which destabilised local soils until significant erosion thresholds were crossed, a cusp event that precipitated the shift from a stable peat environment to an alluvial floodplain (Burrin 1988).

Woodland clearance, along with arable and pastoral agriculture, encouraged sediment deposition onto the valley floodplain and subsequent alluviation downstream. Woodland clearance causes a decrease in evaporative transpiration (or the amount of water that evaporates from leaves, stems, and flowers) and more surface runoff after rain. These changes in the local water cycle can raise the water table, leading to the development of springs, which appears to have occurred at Bodiam. More spring-fed streams further increased surface runoff, which led to higher rates of sediment and alluvium deposition into the river. River valleys in the area, including the Rother, contain up to 10 m or more of alluvium starting in the middle Bronze Age. This build-up was derived from erosion off of adjacent slopes, as well as sediment transported downstream along the river.

As dramatically larger volumes of sediment reached the river valleys, the valleys became shallower and hillsides less steep. Soils formerly attaching woodland to hillsides and mountaintops had entered the alluvial system, eroding the hills while increasing the depth of valley sediments, the width of floodplains, and the volume of sediment washed out to sea. Similar slow, progressive human-induced colluviation has been inferred along multiple Sussex rivers for the Neolithic and Bronze Ages (c. 4000-700 BCE) (Scaife & Burrin 1983; 1985; 1987; 1992; Burrin & Scaife 1984). This period of instability,

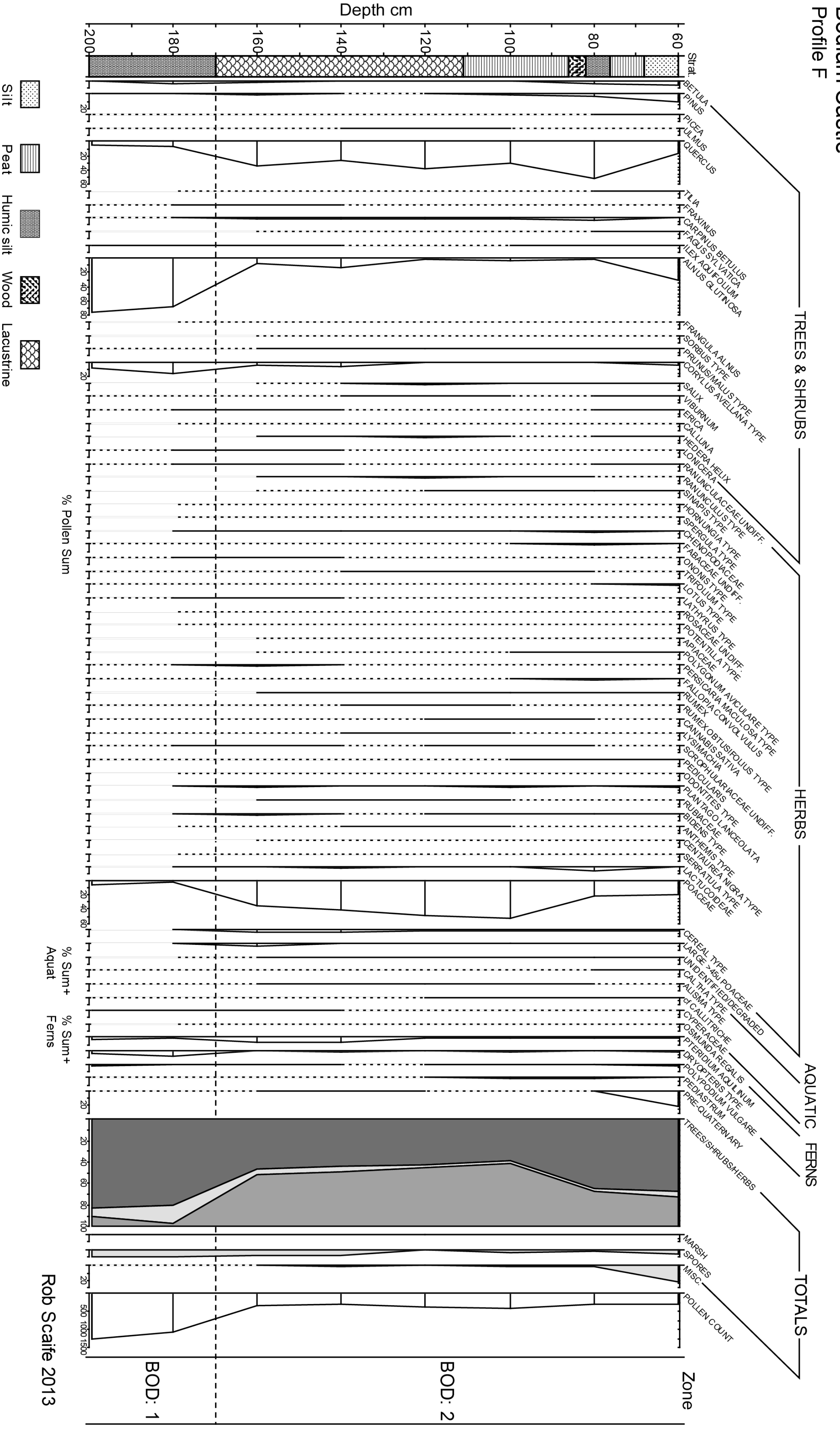


Fig. 5.12: Pollen diagram from Profile F.

characterised by sediment deposition in the Sussex valleys, likely lasted for about 1500 years, resulting in a new but very different environment into the Roman period.

Roman and early medieval

In general, stable wet alluvial conditions appear to have continued through to the medieval period, with mixed woodland, open grassland, and arable mixed agriculture at not too great a distance from the site. The transition of alder carr wetlands (dominated by trees and shrubs) to more open herb fen (dominated by grasses) widened the pollen catchment, allowing pollen from the more distant landscape to accumulate at the sample sites due to both fluvial and airborne transport. This opening of the landscape and increased erosion may also correspond to the infilling of river meanders, creating a wider, deeper channel that facilitated river traffic to and from the harbour at Bodiam throughout the medieval period. A shift from a wooded landscape to open grasslands was also observed in the vicinity of the medieval harbour during work in the Rose Garden (Priestley-Bell & Pope 2009) (see Chapter Two, this volume).

After the decline of lime pollen, oak and hazel (probably managed) became the dominant woodland on well-drained soils, with some birch, pine, and hornbeam. These taxa produce pollen that can travel significant distances on the wind, and so the mixed woodland may have been located at some remove from the site. However, less common taxa like ash, beech, holly, and some remaining lime do not travel such distances (Andersen 1970; 1973), and were therefore likely growing in close proximity to the site, despite the wet conditions. Furthermore, there are some indications (especially in Profile A) that earlier cultivated fields may have been successioning into woodland during this time.

Late medieval and post-medieval

Bodiam Castle was constructed in the 1380s, most probably in a low-lying, already wet place, either within or just adjacent to the Rother floodplain and close to woodlands and mixed arable agricultural land. The fine-grained, low-energy, freshwater sediments in the castle profiles (A1 & A2) suggest that the castle and moat might have been deliberately placed atop a freshwater spring, making full use of the watercourses and natural springs to feed the newly constructed moat. It may be worth considering how this change in local hydrology would have affected the villagers, who may have used nearby springs to supply household water and irrigation. We found no evidence that the castle was built atop a much older manorial site, nor that a raised platform was constructed purposely for the castle foundation. Rather, the moat appears to have been excavated around the castle site, with some additional building up and levelling off of the floor within the castle. Excavated sediment from the moat was dumped close by, to build up the moat bank, and in low-lying wet areas such as nearby ponds. Proximity to water and aquatic resources would have been important to the castle inhabitants: for domestic use, to fill the moat and fishponds, to run the watermill, and to transport goods up and down the Rother via the flote or harbour (James & Whittick 2008).

The present study also did not provide evidence for or against the presence of a harbour as attested by documentary sources. Dallingridge may have diverted the course of the river from an original course slightly farther north (encroaching the present car park and touching the south-west corner of the mill pond), with the old course serving temporarily as mill runoff or as a small harbour (Whittick pers. comm.; Drury & Copeman 2016). However, Core B would not have intercepted either river course, so the present study cannot address this possibility.

Sediments within the castle, especially Profile A2, suggest that some of the original castle floors may have been flagstones atop a padding of chalk. After the castle was abandoned, probably in the middle of the 17th century, the flagstones were removed and humic, silty soils accumulated atop the chalk. Very small quantities of tree pollen suggest that trees were never common within the castle itself; limited amounts of pollen would have blown across the moat, while small amounts of cereals and herbs are likely the result of food processing, domestic waste, sweepings, and floor coverings during the active habitation of the castle. On the other hand, significant quantities of non-cereal grasses, ferns, and ivy pollen suggest these were growing within the castle and along the walls of the castle, probably after abandonment, consistent with eyewitness reports and artwork from the post-medieval to early modern periods (Fig. 5.6).

Woodlands, both wet alder carr and dryland oak and hazel, remained an important element of the landscape of Bodiam through the medieval and post-medieval periods. Better drained soils may have hosted enclosed parklands, actively managed and likely coppiced, that included pine, spruce, hornbeam, lime, beech, and holly. These taxa may have been introductions to the managed landscape surrounding the castle. Hornbeam, lime, beech, and holly are usually poorly represented in pollen profiles unless the trees were in close proximity to the sample site. Historical records suggest that pine and spruce in particular may have been introduced during the first half of the 18th century, when they become a popular feature of elite gardens (Evelyn 1664).

Though pollen profiles cannot distinguish between nearby fields and secondary sources such as processing activity or domestic waste, it is clear that cereals including rye (*Secale cereal*), hemp or hops, and grazing livestock were important elements of village and castle economy. The presence of grassland, both pasture and cereal, reiterates the significance of a mixed arable agricultural economy to the Bodiam landscape throughout its history, especially during the medieval period.

Conclusion

Through most of the Neolithic and into the early Bronze Age, the landscape near what would become Bodiam Castle and Village was a waterlogged, swampy woodland in the floodplain of the Rother, with alder trees forming the canopy above soggy peat growth. In slightly higher areas, where the land was drier and better drained (likely in the direction of the Weald), grew deciduous woodlands of lime, oak, elm, and hazel. The wetland expanded during the early Bronze Age, encroaching into previously drier areas, with alder trees replacing lime.

Though some of these early changes may have been due to woodland clearance for agriculture, the major effects of agricultural activity manifested during the middle Bronze Age. Soil erosion from surrounding areas increased, and the Bodiam landscape became a seasonal alluvial floodplain, clogged with sediment during much of the year and hosting wet grasses and herbs when the soils were sufficiently stable.

By the Roman period and into the early medieval period, this increased erosion and water runoff had created a deeper, wider river channel, facilitating maritime trade. The landscape near what would become the castle was still primarily wet for much of the year, likely fed by springs, with some woodlands and arable agricultural fields at not too great a distance. This low, wet place, between the floodplain with its harbour and the dry agricultural fields, presented an ideal location to dig a moat by the late 14th century. From the late medieval period to the present, managed watery features and active landscaping practices have kept the Bodiam landscape largely dry and dominated by woodland, grassland, and cereal production, though low-lying areas (such as the overflow car park/ medieval mill pond) are still prone to flooding in severe weather.

Through analysis of pollen and the stratigraphic record of the site at point locations, we were able to investigate the evolving relationship between the Bodiam landscape and the people who lived in the area over the last six thousand years, from the Neolithic to the present. Most critically, early arable agriculture during the Bronze Age caused a shift from swampy alder wetlands to an eroding floodplain with high sediment flux. These changes created a landscape that supported the creation of a harbour, and later, a self-sustaining moat and a series of ponds that in part helped to drain the surrounding land. Bodiam's position, between the Weald and the marsh, made it not just an ideal location for trade and commerce between the two regions, but also continued a long history of negotiations between people and their landscape, as the push and pull between wetland, floodplain, and woodland both shaped and was managed by the human occupation of this dynamic landscape at the convergence of ecological zones.