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THE ENVIRONMENTAL IMPACT OF PREHISTORIC MAN AS RECORDED IN THE UPPER CUCKMERE VALLEY AT STREAM FARM, CHIDDINGLY

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A floodplain section of the upper Cuckmere valley near Stream Farm has been investigated. The litho-stratigraphy and bio-stratigraphy of a 6.6-metre fill sequence is described and the Holocene palaeoenvironmental conditions in the fossil record are briefly outlined. It is evident that the alluvium has accumulated largely in response to the impact of prehistoric man on the former vegetation cover, particularly during the Neolithic and Bronze Age. There is little evidence of more recent episodes of alluviation, suggesting the contemporary floodplain is a relic landform. A tentative archaeological model is presented of the apparent environmental impact of prehistoric man in Sussex as regards valley alluviation.

INTRODUCTION

Recent archaeological research has suggested that the Chalk and Greensand lithologies may not have been the only areas of prehistoric activity in Sussex (e.g. Tebbutt 1975; Jacobi 1978; Drewett pers. comm.). With such evidence it is becoming increasingly important that our view of the Weald, long thought to comprise unpopulated areas of dense forest, should be revised. Bio-stratigraphical and litho-stratigraphical investigations have been carried out throughout the river Ouse valley with emphasis being given to the sequence analysed at Sharpsbridge (Burrin 1983; Scaife & Burrin 1983; Burrin & Scaife 1984). Subsequent studies of the river Cuckmere floodplain at Stream Farm, Chiddingly, illustrate that the data pertaining to the Ouse are not restricted to this system alone. This suggests a wider, more substantial environmental impact by prehistoric man as recorded in the floodplain sediments.

FLOODPLAIN DEPOSITS AT STREAM FARM

The floodplain site chosen for study at Stream Farm lies east-south-east of the farm flanking one of the narrow ghylls draining the Dudwell anticline and forming part of the western branch of the upper Cuckmere headwaters. The site (TQ 557157) lies immediately upstream of the old mill which marks the approximate location of the former Stream blast furnace (Straker 1931).

Subsurface investigations were undertaken by the sinking of 11 boreholes using Macintosh and Hiller augers. The position and elevation of each borehole were fixed by field survey. Interpolation between the borehole logs revealed the presence (Fig. 1) of a buried, narrow and relatively flat rockhead bench cut into the Lower Cretaceous Ashdown sand with a mean elevation of *c.* 31.5 metres O.D. This bench lies beneath the Cuckmere first terrace and may have been formed contemporaneously with the former floodplain. If so, it is probably late Pleistocene (Devensian?) in age. A deep, polycyclic gorge or 'channel' with a minimum elevation of *c.* 26 metres O.D. has been cut into this bench. This rockhead or sub-alluvial surface is partly veneered by a thin accumula-

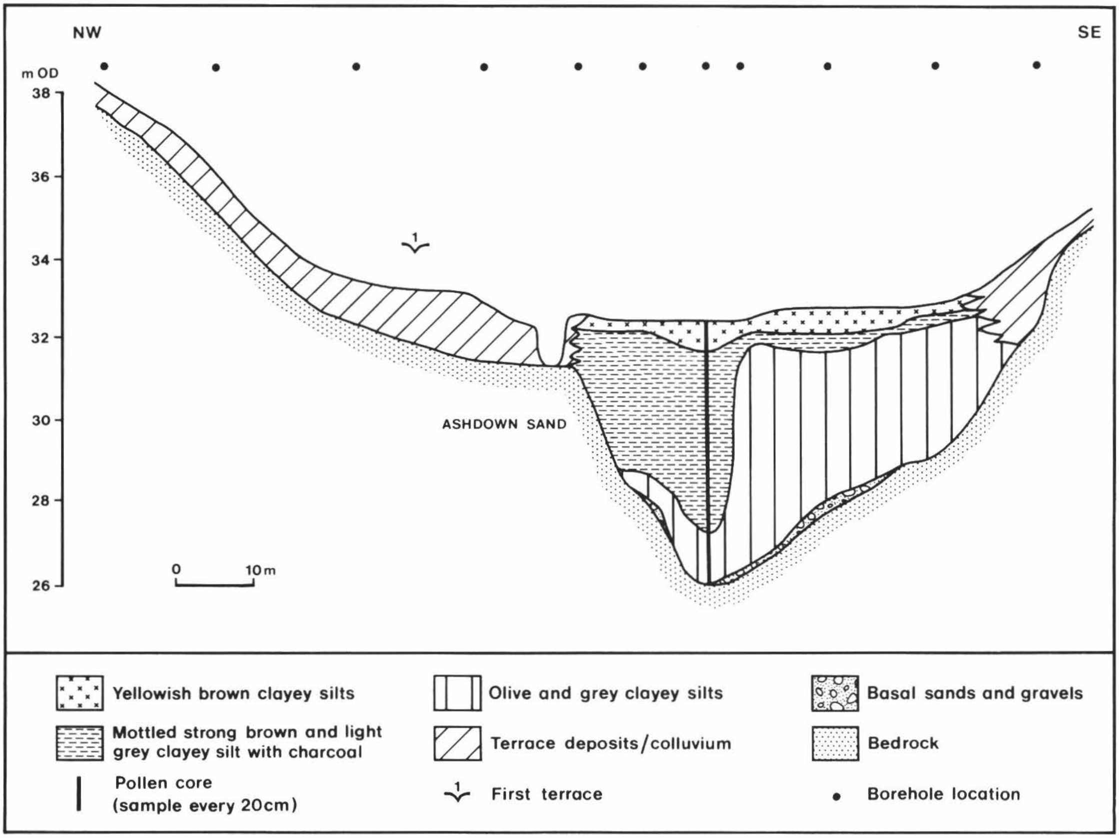

Fig. 1. The Cuckmere valley fill at Stream Farm, Chiddingly.

TABLE 1

The Litho-Stratigraphy and Related Palynological Assemblage Zones (see Fig. 2) of the Stream Farm Alluvial Sequence

Unit	*Depth*	*Description*
3	80–0 cm.	Yellowish-brown (10YR 5/4, 5/6), dark yellowish-brown (10YR 4/3, 4/4), dark brown (10YR 3/3) and brownish-yellow (10YR 6/6) fine sandy clayey silts. Corresponds with pollen assemblage zone SF:4 and SF:5. 0–70 cm. shows pedogenic activity. Pollen assemblage zone SF:5.
2	520–80 cm.	A mixed and variable deposit consisting of strong brown (7.5YR 5/6, 5/8) and light grey (2.5YN 7/0) silt, often mottled with dark brown (10YR 3/3), dark yellowish-brown (10YR 4/4, 5/6), pale yellow (2.5Y 7/4) and reddish-yellow (2.5Y 6/8). Unit contains a variable charcoal content. Pollen assemblage zones SF:2, SF:3 and possibly the lower part of SF:4.
1	660–520 cm.	Olive (5Y 5/4), olive grey (5Y 4/2) and olive brown (2.5Y 5/4, 5/6) clayey silt, with occasional small charcoal fragments. Pollen assemblage zone SF:1.

tion of clayey sands and gravels, which is buried in turn by up to 6.6 metres of relatively homogeneous fine sandy and clayey silts (much of which is reworked loess: see Burrin 1981; 1983). This fill is a significant accumulation given the upstream location of the site, being some 28 km. inland from Cuckmere Haven, and can be divided into three litho-stratigraphical units (Table 1). These units are extraordinarily similar to units SH:2, SH:3 and SH:4 described at Sharpsbridge in the middle Ouse valley (Scaife & Burrin 1983; Burrin & Scaife 1984) despite their presence in an adjacent drainage basin.

POLLEN ANALYSIS

Pollen analysis was carried out on the above sediment sequence. Pollen and spore preservation were variable with a range of degraded to well-preserved grains relating to varying modes of pollen transport and deposition. A pollen sum of 500 grains was counted at each level at a sampling interval of 20 cm. Pollen data are presented in abbreviated diagram form (Fig.2) with arboreal taxa calculated as a percentage of their total and all extant taxa as a percentage of this sum. A description of the changes occurring within this sequence is as follows from the base at 660 cm. upwards:

SF:1 660–520 cm. Characterized by high percentages of *Quercus, Tilia, Alnus, Betula* and *Corylus* type. A diverse assemblage of herbs is present dominated by Gramineae and *Plantago lanceolata;* monolete Pteridophyte spores are numerous. This basal zone of the sequence represents a phase of substantial anthropogenic activity. The zone has a somewhat disjunct/mingled appearance which, coupled with the fact that sediments in the upper part of the zone contained little or no pollen, possibly indicates destabilization of valley side soils and rapid inwash of sediments. It is important to note that the pollen of cereals occurs to the base of the sedimentary sequence in addition to a diverse range of other, often arable associated types. This illustrates that the total 660 cm. present postdates agricultural activity, implying, therefore, that very substantial quantities of sediment aggradation have taken place within the valley from the Neolithic or early Bronze Age onwards.

SF:2 520–310 cm. This zone appears to show sedimentation accruing through time in a more continuous manner. This is evidenced by the smoothly and continuously changing pollen spectra of individual taxa. The zone is again characterized by similar arboreal taxa with *Tilia* dominant in the lower half of the zone (50% AP). The latter's appreciable decline (from 480 cm.) is, however, a phenomenon widely recognized in southern England (Turner 1962; Baker *& al.* 1978; Scaife 1980) but which is asynchronous. It has been recognized in the river Ouse valley at Sharpsbridge (Scaife, in Burrin 1983) and at Wellingham (Brooks, in Robinson & Williams 1983). Characteristically this decline also shows an inverse relationship with the increasing occurrence of herbaceous pollen and large numbers of pre-Holocene (Cretaceous) palynomorphs and Pleistocene pollen. It is very likely, therefore, that this reduction in *Tilia* pollen resulted from forest clearance and, subsequently, arable agriculture probably during the Bronze Age.

SF:3 310–230 cm. Characterized by woodland composed of *Betula* (increasing), *Quercus, Alnus* and *Corylus* type but with a notable absence of *Tilia.* Arable agricultural activity is still in evidence with pollen of cereals and arable weeds present. Gramineae as in zone SF:2 are dominant. Derived Cretaceous spores and Pleistocene pollen increase markedly. An increase of *Pinus* to 220 cm. can be categorized as 'derived' along with definite Pleistocene *Picea* and *Abies* pollen from nearby river terrace deposits. Preservation of these genera was poor, showing substantial exine degradation. From this it can be suggested that further inputs of raw sediments from the interfluves were taking place, again possibly in response to increasing later Bronze Age agricultural pressure or changing agricultural practices.

SF:4 230–70 cm. A marked increase in herbaceous pollen, aquatics/marginal aquatics, ericaceous shrubs and spores of *Pteridium* occurs. *Betula* also increases while *Quercus, Corylus* type and *Alnus* remain relatively dominant. Of the herbs, Gramineae are again dominant (85% of AP) with much increased percentage values of cereal type, *Plantago lanceolata* and taxa of waste land. These are indicative of further agricultural activity, especially at the base of this zone. This is again indicated by an increase in pre-Holocene pollen and spores. Such exploitation may have been responsible for subsequent changes in the ground water hydrology and increased run-off. This perhaps resulted in waterlogging of the floodplain as evidenced by aquatic and marginal aquatic vegetation. Pollen preservation of the latter was good, including *Myriophyllum alternifolium* and *Sparganium* type (including *Typha angustifolia*) in quantity. Fluvial transport of these aquatic taxa may have occurred from upstream lakes, but in view of the pollen preservation noted an autochthonous origin seems plausible. Such changes in ground water hydrology and waterlogging have been seen in other areas of southern England to result from forest clearance (Moore & Willmot 1979; Scaife 1980). This cannot as yet be proven as the cause here, for other factors such as natural influences (e.g. beaver damming), anthropogenic interference downstream, or climatic change and base level fluctuations are possible explanations.

SF:5 70–0 cm. This uppermost pollen assemblage zone shows increased percentages of *Pinus* with *Betula, Quercus* and *Corylus* type sustaining similar relative proportions. Aquatics noted in SF:4 are reduced as also are the cereal and arable agricultural weed indicators. This zone is problematical in its dating and interpretation. The increase in *Pinus* could be similar to those peaks occurring in SF:3 and SF:4, although less exine degradation is evident. Such an increase in *Pinus* is frequently seen in the uppermost sequences of peat pollen analyses from southern England and is a response to the introduction of 'exotic' plantation pines during the last 300 years. There is, however, good evidence (Burrin 1983; 1985) that little sediment accretion has taken place on many Wealden floodplains during the historic period. At Stream Farm this is indicated by the absence of slag from the Waldron and Stream blast furnaces (Straker 1931) within the alluvium. The Waldron furnace some five km. upstream produced quantities of slag which are found in the contemporary channel (Burrin 1985). A similar occurrence is found in the present stream channel immediately downstream from the former blast furnace site. From this it appears that sedimentation had probably ceased

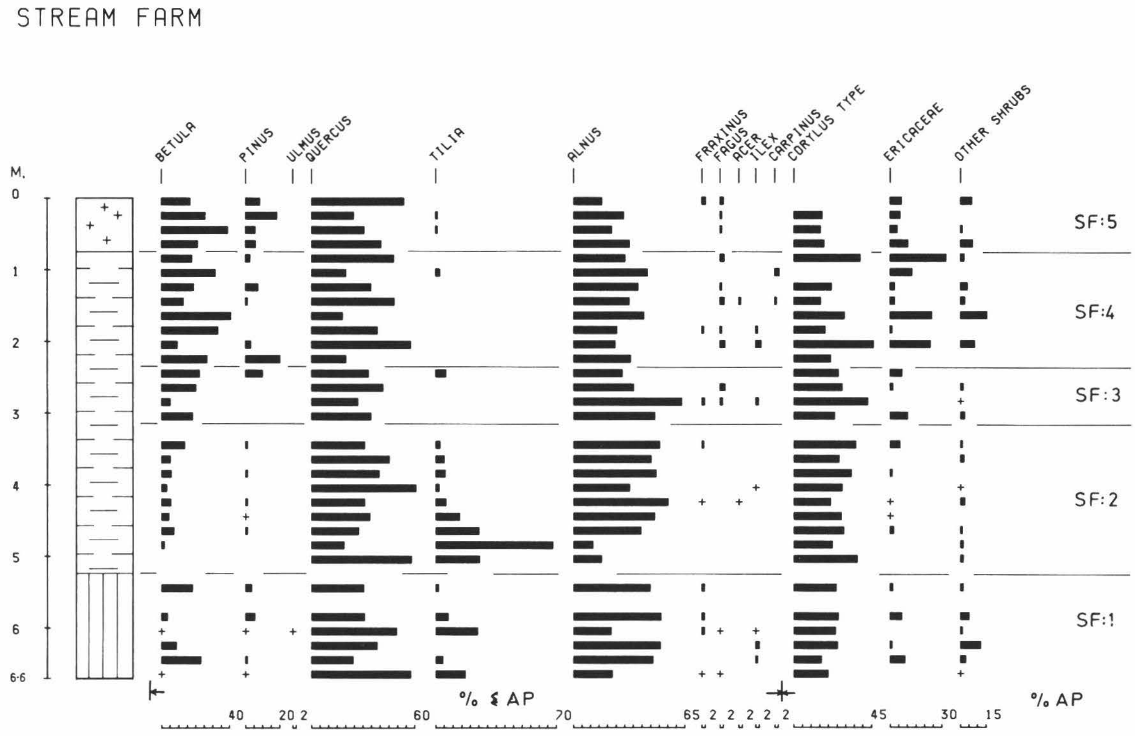

Fig. 2. Palynology and bio-stratigraphy of the Cuckmere valley fill at Stream Farm, Chiddingly.

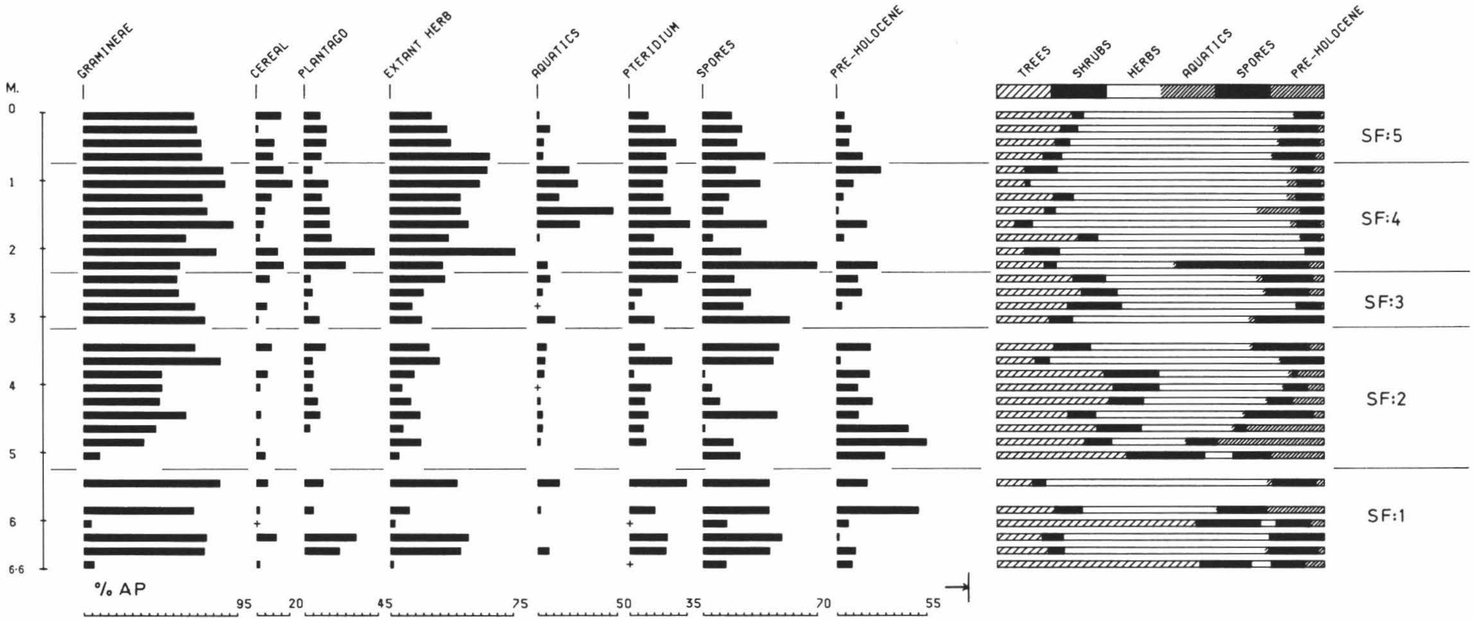

Fig. 2. Palynology and bio-stratigraphy of the Cuckmere valley fill at Stream Farm. Chiddingly.

by the 18th century or earlier. It is likely, therefore, that pedogenic processes have been operating with the incorporation of more recent pollen into the uppermost sediment levels by faunal (earthworm) mixing, thus producing the distinctive bio-stratigraphical assemblage.

DISCUSSION AND CONCLUSIONS

It has been demonstrated by subsurface investigation that substantial volumes of sediments occur in the Ouse and Cuckmere valleys. These have been dated to the Holocene. Of considerable archaeological importance is the fact that significant valley sedimentation (530 cm. at Sharpsbridge and 660 cm. at Stream Farm) has occurred since the introduction of arable agriculture in this region. Although the nature of the sediments (being predominantly inorganic, reworked loessal material) has prevented absolute dating, it has become clear that Neolithic and subsequent prehistoric agriculture was largely responsible for initiating what subsequently became a relatively continuous input of sediments by hillwash from the surrounding interfluves. This occurred as a consequence of soil destabilization caused by forest clearance and consequent modification of the hydrological system. The result of this must have been the loss of substantial quantities of valley side soils through the process of hillwash. The magnitude of this can be judged by the fact that deep sequences of sediments such as described above can be traced throughout the length of the river valleys (Burrin 1983). In addition to this post-Neolithic sediment accretion, phases of increased anthropogenic activity have resulted in related pulsed inputs of sediment. At Stream Farm and Sharpsbridge the *Tilia* decline is the clearest example of this. By analogy with other pollen data from southern England it is likely that this occurred during the middle Bronze Age, although this is an asynchronous phenomenon variously dated from the later Neolithic in the Isle of Wight (Scaife 1980) to Saxon in Epping Forest (Baker *& al.* 1978). These phases of apparently increased agricultural activity may have been the result of changing agricultural practices, or of increased land pressure necessitating further deforestation.

Consideration of the Stream Farm floodplain deposits in conjunction with other related valley studies allows a tentative model of the Holocene palaeoenvironmental conditions in Sussex to be outlined, and the apparent impact of prehistoric man evaluated. It is evident that during the late Devensian or early Flandrian the Sussex area was mantled by a blanket of windblown loess possibly up to 4 metres in thickness (Catt 1978; Burrin 1981; 1983). Rapidly rising base levels consequent upon climatic change *c.* 10000 b.p. encouraged substantial alluviation in the lower valleys, with variable amounts of peat development. In some inland locations, the impact of Mesolithic man may have been sufficient to cause or exacerbate significant inwash of material to the valley bottoms as at Sharpsbridge in the Ouse valley (Scaife & Burrin 1983). In downstream locations, valley alluviation appears to have continued throughout the Atlantic period (Thorley 1971; 1981; Brooks, in Robinson & Williams 1983), although erosion was occurring at some other sites (e.g. Sharpsbridge). After the climatic optimum (Atlantic period), it appears that inland valley sedimentation developed largely as a result of pulsed inputs of materials from the valley sides as a direct consequence of human activities. This is witnessed by: (i) dry valley colluvial records from both Kent and Sussex (Kerney 1963; Kerney *& al.* 1964; 1980; Bell 1981; 1982; 1984); (ii) the inadvertent removal of cover loams (soil erosion) by prehistoric man which initiated soil deterioration, and resulted in the widespread establishment of heathland on podzolic soils (Macphail 1979; Scaife & Macphail 1983); and (iii) the choking of Sussex rivers with materials, thereby causing or helping to promote floodplain development (Burrin 1983). Evidence to date suggests that Neolithic and Bronze Age activity was particularly significant in promoting inland valley sedimentation. Interestingly, historic man appears to have played a far less emphatic role in terms of environmental impact than his predecessors (see Robinson & Williams 1983; Burrin 1983; 1985).

Two other points are also noteworthy. Firstly, a somewhat different view of palaeoenvironments is created by the study of pollen from different sites, e.g. peat mires compared with soil pollen studies or minerogenic floodplain sequences. It is evident that a composite picture is now emerging from these very different situations, from which a more complex interaction between prehistoric man and his environment is apparent. Secondly, the results presented herein indicate a widespread and significant anthropogenic impact in the Weald, in contrast with the traditional view, based on the general paucity of artefactual evidence, that the region remained a dense and unbroken forest throughout the Holocene. It is clear that not only were the chalklands being subjected to anthropogenic pressures as a result of pastoral and arable agriculture and the resultant colluviation and aggradation of some dry valleys (Bell 1981; 1984), but that such activities were considerably more widespread, resulting in what must have been on occasion severe valley side soil erosion. This contradicts previous archaeological thought about the Weald during prehistoric times. Any future archaeological observations which confirm or deny the levels of anthropogenic activities and associated pressures described here would be warmly welcomed.

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