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REPORT

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TITLE A calcareous tufa deposit and Bronze Age clearance horizon; West Row, Mildenhall, Suffolk

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West Row, Mildenhall, Suffolk (MNL 137): A calcareous tufa deposit and Bronze Age clearance horizon.

The site was first detected* as an ill-defined scatter of burnt flint and charcoal, very approximately 12 x 8m. strewn over the ploughed field surface. A small trench (2 x 1m) was dug across the apparent centre of the deposit, exposing a thin layer of charcoal with burnt flints, resting on a calcareous tufa, sandy towards the base of the section, and resting in turn on a loose gravel.

Sediments

It may be helpful to begin this section with a note on terminology. Strictly speaking tufa is a calcareous sediment formed by precipitation from water heavily charged with lime, under fairly warm climatic conditions. The sediment is essentially a terrestrial deposit, commonly containing mollusca indicating conditions of shaded swamp. (Evans 1972, 297). Shell-marls or Chara-marls, which are common along the fen margins, superficially resemble tufas but were formed in open freshwater conditions by the decay of stems of Chara, which in life are coated with lime (Seale 1975, 23). They contain mainly aquatic molluscs. In this report the term 'tufa' is used to describe all fine-textured calcareous sediments, though the conditions of deposition varied considerably.

1. 0 - 35cm. Black friable humified peat with traces of sand; contains burnt flints and lumps of tufa brought up by ploughing, with occasional angular unburnt flints up to 14mm and derived chalk brachiopods; wood, arable weed seeds, land and freshwater molluscs; boundary disturbed by ploughing.
2. 35 - 40cm. (maximum surviving thickness). Layer of charcoal and burnt flints, shattered by heat (fragments up to 40mm., cortex curvature suggests these were river gravel pebbles); uncarbonised intrusive weed seeds, probably intrusive molluscs; upper surface grooved by ploughing, lower boundary sharp.
3. 40 - 70cm. Tufa: Upper 5cm; Greyish-brown (10 YR 5/2.5) with brownish yellow mottles (10 YR 5.5/6); plastic with a trace of sand; contains flints, some burnt, up to 15mm. (probably pressed into this layer from 2); decayed wood fragments, impressions of plant material, land molluscs, small mammal bone; narrow boundary.

* (footnote) by Mr. Colin Pendleton.

Lower 25cm; very pale brown (10 YR 7.5/3) and brownish yellow (10 YR 6/8); sand content increases with depth; plastic at top, friable at base; content of angular flint pebbles (9mm. maximum at top, 19mm. maximum at base) increases with depth; decayed wood fragments, impressions of plant material, molluscs; ostracods and Characeae oogonia in lower 15cm; narrow boundary.

4. 70 - 80cm. Light yellowish brown (10 YR 6/4) loose highly calcareous sand with cemented patches; contains angular flint and chalk pebbles up to 25mm. and derived chalk fossils; some decayed plant material; freshwater molluscs, ostracods and Characeae oogonia; narrow boundary.
5. 80 - 92cm. Similar highly calcareous sand, with a larger proportion of cemented patches; less plant material; freshwater molluscs, ostracods and Characeae oogonia; sharp boundary.
6. 92 - 105cm. (base of pit). Coarse loose slightly calcareous brownish yellow (10 YR 6/6) sand and gravel, with small cemented patches; angular and rounded flint pebbles up to 40mm; freshwater molluscs.

A transect of auger holes at 10m. intervals was made across the field for a distance of 20m. to the north-west and 30m. to the south-east. In all bores shallow peat soils overlay tufa deposits at depths of 38 - 59 cm. from the present field surface. Impenetrable sandy horizons were encountered between 90 and 120cm. from the surface.

Contamination

The layer of burnt flint and charcoal (2) had been almost destroyed by ploughing. Only 5cm. survived, and this residue had ploughmarks scoured across it. By careful sampling of the undisturbed deposit between the ploughmarks gross contamination has been avoided, although the sample of this material did contain a few intrusive arable weed seeds and fragments of wheat rachis with some straw. The few molluscs from this layer are also thought to be intrusive.
The lower layers were undisturbed at the point of sampling.

Sampling and recovery

A column of samples was taken through the undisturbed deposits. Charcoal was extracted from a 2kg. sample from layer 2 by water flotation, collecting the flot in a 250 micron mesh sieve. 1kg. samples from layers 3, 4, 5 and 6 were disaggregated and washed through a 0.5mm. mesh sieve for the recovery of molluscs, small mammal bone, ostracods and a proportion of the Characeae oogonia.

Biological remains

(1) Charcoal. Fragments from layer 2 larger than 0.5cm. were identified.

The taxa present, in order of abundance, were as follows:

Fraxinus sp. (ash)
Quercus sp. (oak)
Corylus sp. (hazel)
Corylus/Alnus sp. (hazel or alder)

(2) Characeae oogonia. These can range from 0.2mm - 0.9mm in length; only specimens > 0.5mm were extracted.

This partial recovery serves, however, to establish the relative frequencies of oogonia at different depths in the deposit. The numbers of specimens recovered are noted in Table 1. Due to lack of reference material, no attempt has been made to identify these macrofossils further.

(3) Small mammal bone. The sample from the upper 5cm of the tufa produced two teeth (identified by John Goldsmith, Norwich Castle Museum):

Cheek tooth: Clethrionomys glareolus (Schreber) (bank vole)
Juvenile carnassial tooth: Unidentified small carnivore.

(4) Ostracods. The frequencies of ostracod valves are given in Table 1.

(5) Molluscs. The molluscs recovered are listed in Table 1, and the results summarised in Fig. 1.

Dating

Charcoal from layer 2 was dated to 3650 $\pm$ 100 b.p., or 1700 b.c. (HAR - 2690).

'woodland'	Carychium sp.	(2)	34	6	2	-	-	1	-	-	-
snails	Vertigo substriata (Jeffreys)		1	-	1	-	-	-	-	-	-
	Acanthinula aculeata (Müller)		5	-	1	-	-	-	-	-	-
	Clausilia bidentata (Ström)	(3)	1	-	-	-	-	-	-	-	-
	Clausiliidae indet	(4)	9	1	1	-	-	-	-	-	-
	Punctum pygmaeum (Draparnaud)		-	-	1	-	-	-	-	-	-
	Discus rotundatus (Müller)		4	-	-	(1)	-	-	-	-	-
	Euconulus fulvus (Müller)		-	-	-	-	-	1	-	-	-
	Vitrea sp.		3	-	-	-	-	-	-	-	-
	Zonitidae indet.		9	1	-	-	-	2	-	-	-
'Catholic' molluscs	Pomatias elegans (Muller)		3	(1)	-	-	-	-	-	-	-
(inc. P. elegans)	Cochlicopa spp.		2	-	-	-	-	-	-	-	-
	Cepaea/Arianta	(2)	4	(1)	-	-	-	-	-	-	-
	Hygromia hispida (Linne)		4	-	-	-	-	-	-	-	-
Open-country	Vallonia costata (Müller)		4	1	1	-	-	2	-	-	-
snails	Vallonia pulchella (Müller)		-	-	4	-	3	cf. 1	-	-	-
	Vallonia sp.	(2)	5	1	2	3	-	2	1	-	-
Freshwater gastropods	Bithynia tentaculata (Linné)	(5)	-	-	-	1	-	-	1	2	-
	Lymnaea sp.	(2)	-	-	-	-	-	-	1	13	-
	Planorbis crista (Linné)		-	-	-	-	-	-	-	3	-
Freshwater bivalves	Sphaeriidae	(6)	-	-	1	2	-	1	25	30	3
	Unidentified molluscs	(2)	9	1	2	-	-	1	-	2	2
Miscellaneous	Ostracods		-	-	-	1	-	2	4	26	-
macrofossils	Characeae oogonia (>0.5mm)		-	-	-	12	17	23	101	218	7

Table 1: Molluscs etc. from the tufa and underlying sediments.

Notes (1) Apparently all C. tridentatum; no definite specimens of T. minimum observed.

(2) Fragmentary/Juvenile (one whorl or less) (3) Aperture (4) Eroded - colour + sculpturing lost

(5) Opercula (6) Mainly Pisidium; a few possible fragmentary Sphaerium.

	Context No.		3	3	3	3	3	3	4	5	6
	Depth (cm) from surface		40-45	45-50	50-55	55-60	60-65	65-70	70-80	80-92	92-105+
'Shade' or	Carychium tridentatum (Risso)	(1)	44	4	1	-	-	-	-	-	-
'woodland'	Carychium sp.	(2)	34	6	2	-	-	1	-	-	-
snails	Vertigo substriata (Jeffreys)		1	-	1	-	-	-	-	-	-
	Acanthinula aculeata (Müller)		5	-	1	-	-	-	-	-	-
	Clausilia bidentata (Ström)	(3)	1	-	-	-	-	-	-	-	-
	Clausiliidae indet	(4)	9	1	1	-	-	-	-	-	-
	Punctum pygmaeum (Draparnaud)		-	-	1	-	-	-	-	-	-
	Discus rotundatus (Müller)		4	-	-	(1)	-	-	-	-	-
	Euconulus fulvus (Müller)		-	-	-	-	-	1	-	-	-
	Vitrea sp.		3	-	-	-	-	-	-	-	-
	Zonitidae indet.		9	1	-	-	-	2	-	-	-
'Catholic' molluscs	Pomatias elegans (Muller)		3	(1)	-	-	-	-	-	-	-
(inc. P. elegans)	Cochlicopa spp.		2	-	-	-	-	-	-	-	-
	Cepaea/Arianta	(2)	4	(1)	-	-	-	-	-	-	-
	Hygromia hispida (Linne)		4	-	-	-	-	-	-	-	-
Open-country	Vallonia costata (Müller)		4	1	1	-	-	2	-	-	-
snails	Vallonia pulchella (Müller)		-	-	4	-	3	cf. 1	-	-	-
	Vallonia sp.	(2)	5	1	2	3	-	2	1	-	-
Freshwater gastropods	Bithynia tentaculata (Linné)	(5)	-	-	-	1	-	-	1	2	-
	Lymnaea sp.	(2)	-	-	-	-	-	-	1	13	-
	Planorbis crista (Linné)		-	-	-	-	-	-	-	3	-
Freshwater bivalves	Sphaeriidae	(6)	-	-	1	2	-	1	25	30	3
	Unidentified molluscs	(2)	9	1	2	-	-	1	-	2	2

Discussion

1. Local habitat changes (Fig. 1)

The basal deposit (6) was a river gravel containing small numbers of molluscs and plant remains indicating freshwater conditions. The date of the gravel is not known, and indeed may be Pleistocene.

The calcareous sediments overlying the gravel appear to have been deposited continuously. There is no direct dating evidence for the beginning of their deposition, but they are assumed to be all postglacial. The highly calcareous sands (4 and 5) contained many oogonia of stoneworts (Characeae) and freshwater molluscs. These macrofossils suggest that the sediments were formed in still or slowly-flowing water. The lower part of the tufa (3) was also slightly sandy, but the proportion of sand decreased in the upper part of the deposit. The molluscs and other macrofossils from the tufa indicate increasingly dry conditions as sedimentation continued, and the development of scrub and woodland. No Characeae oogonia and ostracods and only one freshwater mollusc were found in samples above 55 cm. depth. The uppermost 5 cm. of greyish-brown, slightly organic, tufa seems to represent an immature rendzina-like soil forming under woodland, tufa deposition having practically ceased. The molluscs from this upper horizon are mainly woodland species (Evans, 1972), though there are a few open-country snails (Vallonia) and specimens of Pomatias elegans. This deposit also produced a tooth of the bank vole, normally found in woodland and scrub. In summary layers 5, 4 and 3 appear to represent a continuous sere from an open freshwater environment to woodland.

Continued development of the vegetation and the immature soil was abruptly truncated by human activity in the area. Layer 2, consisting of charcoal and burnt flint is interpreted as a clearance horizon; the woodland of the immediate area was felled and burnt. The charcoal from layer 2 indicates that in its final stage this woodland included ash and oak, with hazel and possibly some alder. Layer 2 is dated to 1700 b.c. and is contemporary with the nearby Bronze Age settlement (MNL 130). The precise nature of human activity represented by layer 2 is unclear, though obviously it involved the burning of locally-derived timber and the heat-shattering of river gravel pebbles.

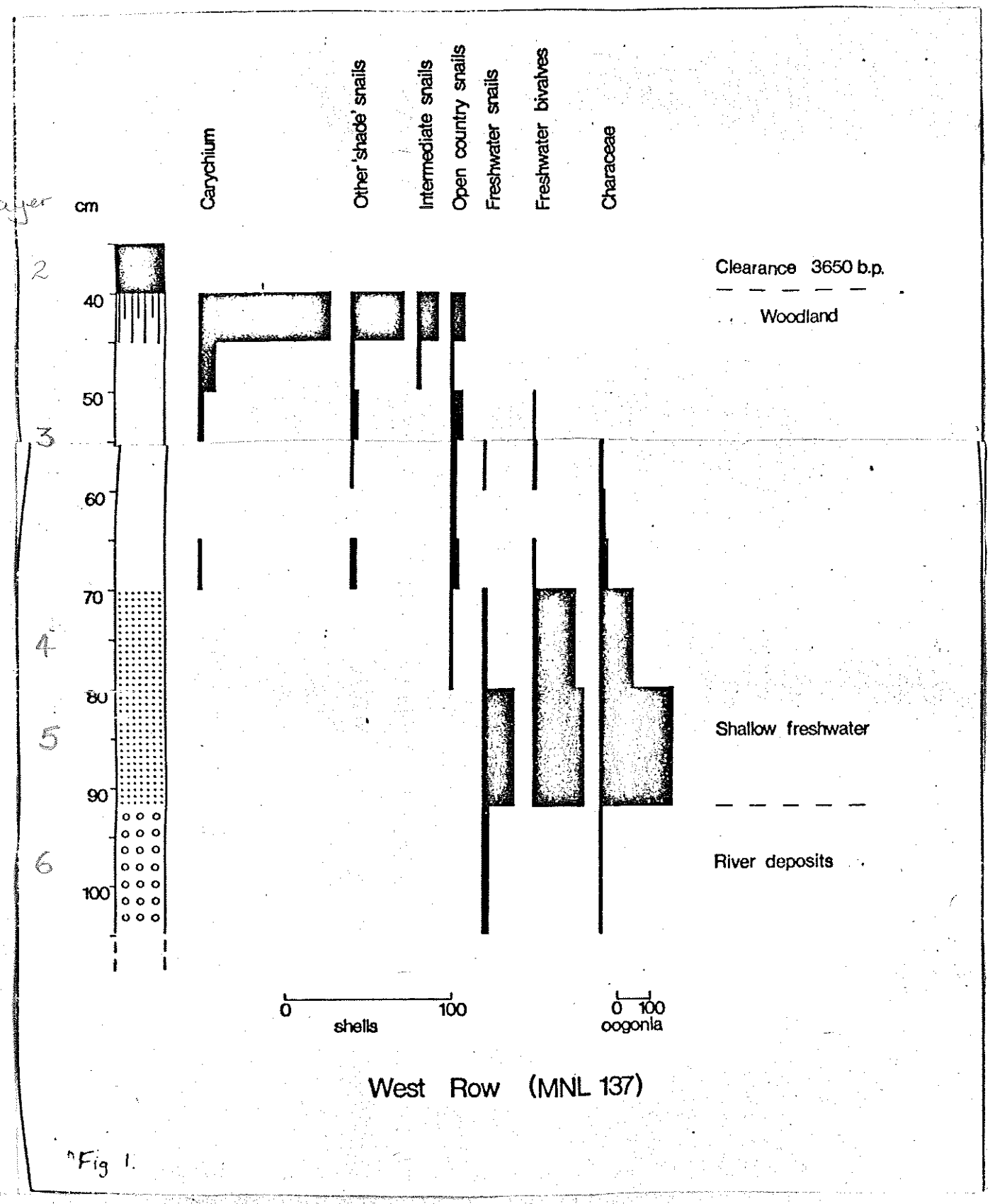
In a final phase peat developed over the Bronze Age horizon. Unfortunately this upper 35cm of peat was humified and completely disturbed by modern ploughing. It included terrestrial molluscs (Vallonia, Cepaea) and aquatic species (Pisidium, Lymnaea, Bithynia, and Planorbis) concentrated in the surviving peat by a winnowing process as peat wastage progressed. The original thickness of peat present before drainage in this area is unknown.

The local sequence may be summarised as follows:

(8) Arable, presumably following use of land for pasture.

(7) Drainage.

(6) Peat development.



West Row (MNL 137)

Fig 1.

(5) Bronze Age clearance.

(4) Woodland development.

(3) Swamp, becoming shaded.

(2) Still or slowly-flowing water.

(1) River gravel.

(2) The Bronze Age environment of Mildenhall Fen: An interim discussion

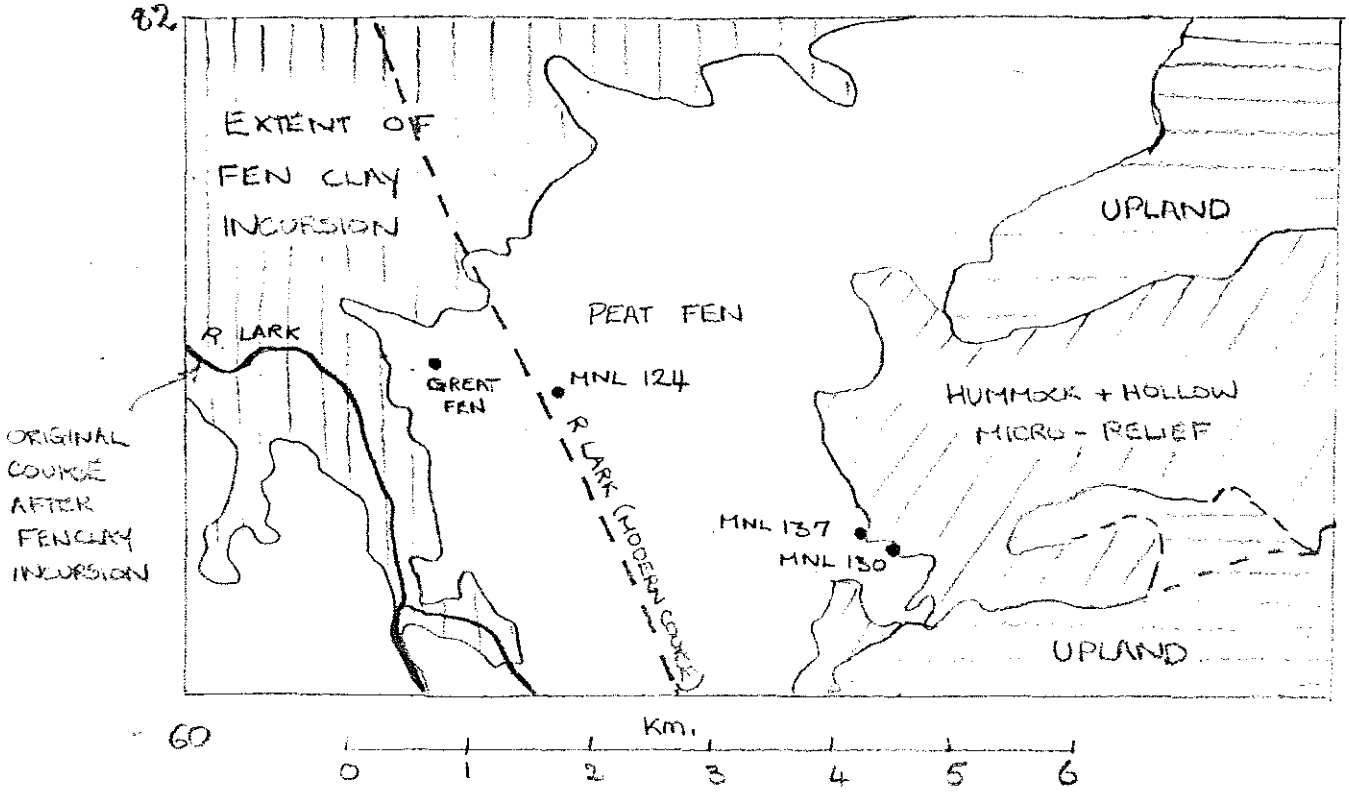
The abundance of archaeological finds and settlement sites in this area suggests a relatively high population density. It is therefore of interest to establish the prevailing environmental conditions in the area at this time, and fortunately several sites have produced palaeoecological information.

This part of the fen-edge was never affected by the Fen Clay marine incursion. The approximate extent of Fen Clay suggested by Seale (1975) is shown on the accompanying sketch plan of the area (Fig. 2). However the edges of this deposit are not clearly defined, and marginal deposits formed in conditions of relatively low salinity occasionally occur. For example, on Great Fen (approx. 621791) lumps of greyish-brown (10 YR 5/2) silt loam brought up by ploughing are to be seen. These contain abundant shells of Hydrobia ventrosa with immature cockle shells (Cerastoderma sp.) and a few freshwater molluscs. Specimens of Lymnaea peregra in this deposit are small (under 10mm), and may represent snails dwarfed by the saline conditions. Such deposits represent the extreme edges of the Fen Clay which is currently thought to have been deposited between about 2600 b.c. and 2200 b.c. in the landward part of the fens (Godwin 1978).

The fens to the south and east of the Fen Clay margin may be divided into two main regions: a continuous area of fen peat, generally 30 - 180cm thick to the west, and an area of hummock-and-hollow micro-relief consisting of sandy ridges surrounding circular or elongated closed hollows filled with peat and shell marl to the east (Seale op. cit.; Fig. 2).

The settlement site at West Row (MNL 130) excavated during 1977 occupied part of one such sand ridge and the occupation horizon spread into an adjacent peat-filled hollow. Examination of biological remains from this site is as yet incomplete, though pollen and macroscopic plant remains indicate a predominance of alder in the woodland of the area. Pollen analysis of sediments from a peaty hollow next to a Late Bronze Age site on Mildenhall Fen excavated in 1935 also showed alder to be the dominant tree species (Godwin 1941). At West Row there is evidence of clearance and the development of open fen and ruderal vegetations around the site. The overall picture is of dry conditions

Fig. 2: MILDENHALL FEN (AND ENVIRONS).



on the sand ridges with, initially, alder carr in the peaty hollow, subsequently cleared. During the occupation of the site there is no evidence for bodies of standing water in the area, though at some date after its abandonment shell marl was deposited.

The 'tufa' site (MNL 137), discussed above, appears to indicate increasingly dry conditions culminating in the development of ash/oak/hazel woodland, which was cleared c. 1700 b.c., probably by the occupants at the settlement site (MNL 130).

A third site (MNL 124), further to the west in the area of continuous peat cover has also produced evidence of human activity at this period. Here a peaty loam formed on chalky drift into which were cut pits and gulleys was sealed by a layer of charcoal and burnt flint, dated to 1770±70 b.c. (HAR 1876). The molluscs from this site are predominantly 'woodland' species but the fruits and seeds are largely of scrub and ruderal taxa. Aquatic species are very rare. The site is believed to represent a small-scale clearance of woodland. Conditions locally were quite dry [redacted] (Murphy 1979).

No sites have been examined in detail to the west of the present channel of the Lark though recent agricultural activities have led to large numbers of oaks, yews and pines being dragged up from the peat. These are not precisely dated though some specimens from Great Fen were apparently rooted in the marginal facies of the Fen Clay noted above. These trees should thus be broadly contemporary with the sites already discussed, and give some impression of local woodland composition.

Overall a picture of mixed woodland types emerges (alder carr in areas of hummock-and-hollow micro-relief; ash-oakwood on the tufa; oak, yew, pine woods on Great Fen) developing in conditions varying locally from relatively dry to moist. All the archaeological sites examined show evidence for local clearance of woodland, but it is not clear how extensive deforestation was in the area as a whole. Before the results from these sites are finally prepared for publication it is probable that further deposits will be examined, which may serve to confirm or modify the present picture. This discussion merely summarises the information presently available and its current interpretation.

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Acknowledgement

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