2
Environment and Land Use in the Valley Bottom

Gill Campbell and Mark Robinson
(with Polydora Baker, Simon Davis and Sebastian Payne)

The grass kept its long sabbath there
Nor dreamed of delving spade or share

John Clare, Walcott Hall & Surrounding Scenery

2.1 Introduction

The environmental evidence from two archaeological features is exceptional:

- the cairn over Barrow 1, which produced more than 180 cattle skulls as well as some aurochs remains;
- the waterlogged deposits in the ditches of the Long Barrow, from which a wealth of biological evidence was recovered.

The evidence from other features and other areas is less impressive. In fact some of it is rather scrappy, consisting of limited biological assemblages from one or two contexts. Taken as a whole, however, the evidence from the soils and sediments themselves – charred and waterlogged plant macrofossils, insects, pollen, molluscs, and animal bone – has given us an insight into the nature of the landscape of the river floodplain and its exploitation by prehistoric peoples. This chapter attempts to bring together this information and discuss the development of the valley floor and the activities that took place within it.

2.1.1 Survival of the environmental evidence

Palaeosols survived beneath barrows, which in turn had been protected from recent denudation by a covering of alluvium.

Charred plant remains and charcoal were recovered in small quantities from many deposits, along with occasional concentrations in some features. While contamination by material of Roman to medieval date was a problem in many prehistoric contexts, useful assemblages were recovered from some well-sealed deposits.

Survival of bone and molluscs in prehistoric contexts was generally poor, due to the soil conditions prevalent in the floodplain prior to alluviation. One notable exception was the cairn overlying Barrow 1. Here the limestone blocks, which formed part of the cairn makeup, along with numerous cattle skulls, produced a localised calcium-enriched environment, leading to better bone preservation. Bone and molluscs also survived well in waterlogged deposits within palaeochannels.

Waterlogged deposits in both palaeochannels and the ditches of the Long Barrow ensured the survival of pollen, insects, wood and plant macrofossils.

2.1.2 Contribution of the various lines of evidence

The different types of material recovered have proved effective at providing information regarding different aspects of the environment and plant and animal exploitation. Work on the soils and sediments has provided us with an understanding of the nature of the floodplain and its physical characteristics, as well as information on the nature of the materials from which the monuments were constructed. Work on pollen has given us the best indication of the extent of clearance in the valley. This is because pollen from contexts that have filled in naturally is derived from a much wider area than the insects and plants that lived or fell into a feature.

The insect evidence has proved effective at distinguishing the nature of any clearance, whether it was for arable cultivation, for pasture or for the provision of open vistas as an integral part of monument-building. This is possible because many of the terrestrial Coleoptera can be divided into ecological groups, based either on the material on which they or their larvae feed, or on their breeding habitats. For example, the larvae of Scarabaeoidea and Elateridae beetles feed on the roots of grassland plants and are indicative of grassland, while scarbaeiod dung beetles are reliant on animal dung, and, when present at a certain level, may be taken as indicative of grazed grassland.

Waterlogged macroscopic plant remains have provided details of local vegetation, while molluscs have also proved a good source of information regarding local conditions. Macroscopic plant remains are especially useful for indicating the presence of scrub. No ecological grouping of insects was recognised as indicative of this habitat and as most scrub species are insect-pollinated they tend to be under-represented in the pollen record.

The nature of the evidence from charred plant remains (including charcoal) and animal bones has meant that it has been more useful in providing evidence of particular activities, rather than in giving a general economic picture. The assemblage from the Grooved Ware pit, for example, is typical of such deposits, and would appear to be related to a particular activity or set of activities.

What is largely lacking, however, from the environmental picture is information regarding the development of the valley sides and the clay uplands. We have no environmental evidence from these zones. Pollen-bearing deposits were not located, and, although sampling was undertaken during trial excavations at the Cotton 'Henge' (SS1.10), no interpretable assemblages were recovered.

2.2 The environmental sequence: a bird's eye view from the Late Devensian to the Late Bronze Age

2.2.1 The Late Devensian

A single section through a channel (in trench B139) gave very limited evidence for conditions in the valley bottom during the Late Glacial (Late Devensian zone III, *c* 11,200–9300 Cal BC or 11,000–10,000 BP), when the floodplain gravels were being reworked by braided channels (Panel 2.1). Organic sediment interstratified within gravel at the edge of the channel contained the beetle *Helophorus glacialis*, which is characteristic of snow-meltwater pools, and a seed of the arctic-alpine shrub *Betula* cf *nana* (dwarf birch). Buds of *Salix* sp (willow) were also present. In the harsh, cold conditions of the Late Devensian the floodplain is likely to have presented an environment of a sparsely vegetated, unstable, gravel or sandy-loam surface with low clumps of dwarf birch and willow scrub.

Panel 2.1 The prehistoric palaeohydrology and floodplain development of the river Nene in the Raunds area *Mark Robinson*

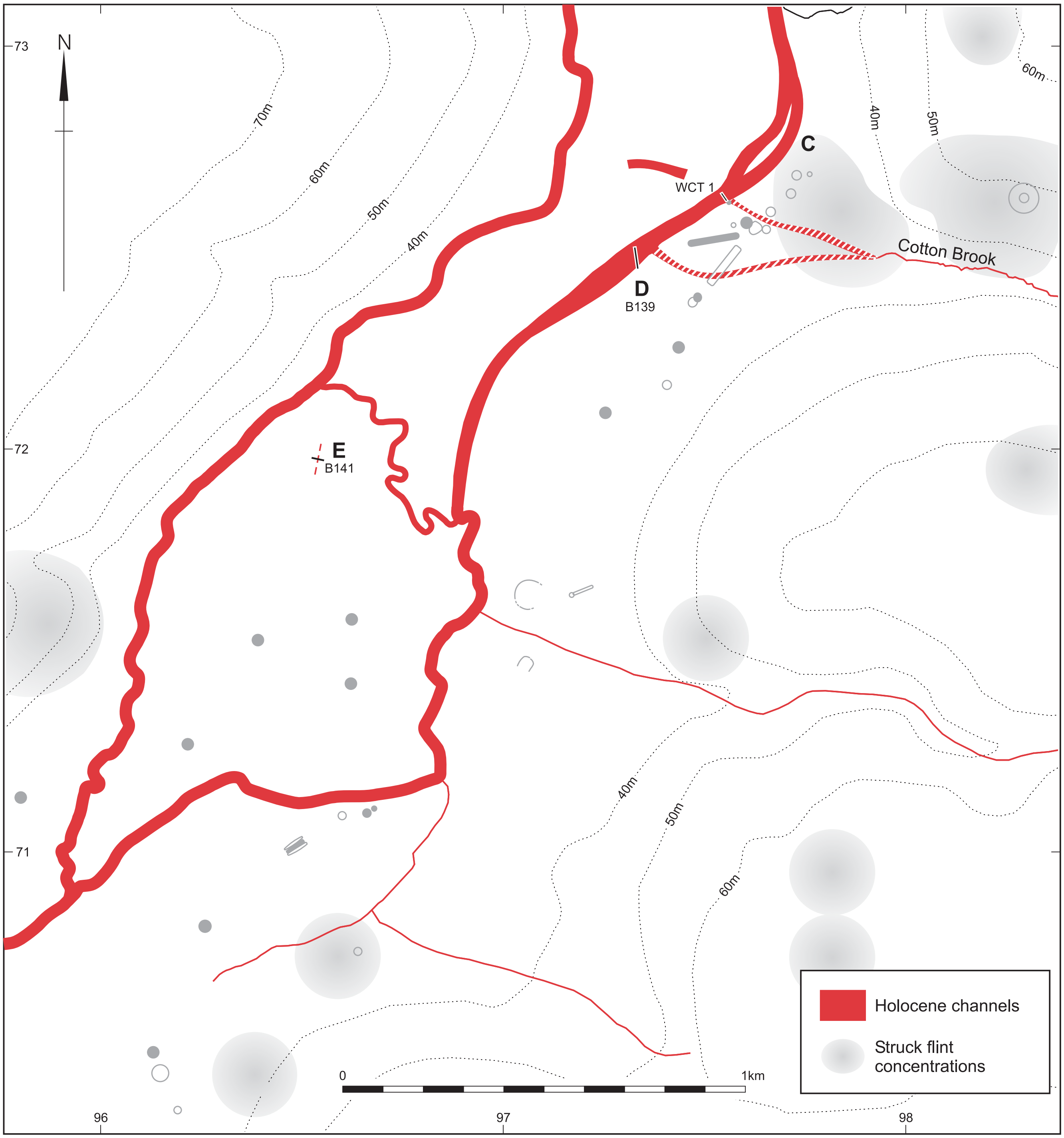
The floodplain of the River Nene within the Raunds Project area comprises a block of the valley floor up to 1 km wide, running for about 3.5 km along the eastern bank of the present channel of the river from above Redlands Farm to below Mallows Cotton. It was mostly covered by alluvial clay to clay loam that, along its eastern edge, gently slopes up onto and laps over the First Gravel Terrace. The modern course of the River Nene runs along the western edge of the floodplain and is very much a managed river, in which sharp bends have been straightened. Several streams cross the floodplain and drain into the river. They too have been straightened and, in the case of the Cotton Brook, canalised along a completely different channel from the original course.

Two studies were undertaken on palaeohydrology and floodplain development as shown by the excavations and exposures at Raunds. One, by Brown, was part of a wider study of the middle Nene and Soar valleys (A Brown and Keough 1992a; 1992b; 1992c; A Brown *et al* 1994), the other, by Robinson, was part of a wider study of the upper Thames, middle Nene and middle Ouse valleys (Robinson 1992a).

The prehistoric channels

Gravel aggradation had ceased and an anastomosing (multiple cross-linked) system of relatively stable channels had become established just before the start of the Flandrian (ie shortly before 10,100 BP, *c* 9700 Cal BC). Channel E (in trench B141), which was only traced for a short length, was abandoned in the early Flandrian, a radiocarbon date of 9220–8260 Cal BC (9370±170 BP; HAR-9243) being obtained on organic sediments from the bottom. Little lateral channel migration occurred during the Flandrian. The plan shows the channels that were active throughout the prehistoric period as shown by excavated palaeochannels and relict stream courses. Brown and Keough (1992b, 188, 200) proposed a period of channel change between 2500 Cal BC (*c* 4000 BP) and the start of the Christian era (*c* 2000 BP) with sudden shifts in channel courses of the Nene by avulsion. However, this was not borne out by field evidence from the floodplain at Raunds, where the sequence was one of the simplification of an anastomose to a single channel system by siltation and channel abandonment in the medieval period.

There was little evidence for sedimentation in the West Cotton channel during the first half of the Flandrian. However, a series of Late Neolithic radiocarbon dates was given by wood in organic sediments in the channel including 3370–2470 Cal BC (4300±150 BP; HAR-9241) at the Channel C section and 2920–2870 Cal BC (4268±32 BP; UB-3419) from sediments beneath a Neolithic timber platform in the channel at West Cotton itself. It is possible that the sedimen-



tation was related to clearance. The Neolithic channel at West Cotton was broad, being over 35 metres wide, and relatively shallow. Clay sedimentation, mostly thought to be Roman in date, had reduced the width of the channel to a half by the middle Saxon period, and it became entirely silted during the early medieval period (Robinson 1992a, 199).

The aquatic insects from the Neolithic channel comprised a fauna of clean, well-oxygenated, flowing water with well-vegetated margins. They included beetles from the family Elmidae, such as *Stenelmis canaliculata*, which is now very rare (they cling to stones on the bed and are very fastidious in their requirement for clean, well-oxygenated water).

It is difficult to determine the prehistoric course of the Cotton Brook to its junction with the West Cotton channel. Topographic evidence, and the discovery of deep organic sediments, suggested a southern route, which would have cut across the line of the Long Enclosure. However, a possible prehistoric stream junction excavated in the West Cotton channel might imply a route to the north of the monuments, close to the course of a late- or post-medieval canalisation of the stream.

The prehistoric floodplain surface

The surface of the Late Devensian gravels experienced pedogenesis (soil development) at the start of the Flandrian. A neutral brown earth soil of sandy loam to silt loam developed on the higher areas of the floodplain to the east of the palaeochannel at West Cotton and the Stanwick Villa, on much of the Irthlingborough Island and at the Redlands Farm Long Barrow site. It possibly had a loessic component. Soil acidification following Neolithic clearance resulted in the downwash of clay, with a transition to an argillic soil. A clay loam, probably of alluvial origin, covered the lower areas of gravel. It was gleyed on the lowest-lying parts of the site. The lowest areas of floodplain, with the gleyed soils, were probably wetlands throughout the Flandrian and it is possible they experienced limited prehistoric inundation in the early or mid Flandrian. However, there was no evidence from any of the prehistoric archaeological contexts on the floodplain for flooding, and prehistoric alluvial sediments were confined to the palaeochannels.

The higher areas of the site with the brown earth soil would have presented during the prehistoric period a well-drained environment very different from the modern floodplain. In fact, the prehistoric landscape was only a wetland landscape in the sense that it was dissected by river channels, some of which had marshy areas alongside them. The drier areas were suitable for cultivation, indeed the brown earth palaeosol only survived intact beneath the prehistoric barrows, elsewhere gravel had been mixed into it by Roman, and possibly earlier, ploughing.

Roman ploughing was followed by early medieval cultivation. Hydrological change suddenly occurred on the floodplain in the early medieval period, when ridge and furrow at West Cotton was sealed by up to 2m of clay alluviation (Robinson 1992a, 201). This alluviation changed the topography of the valley floor, levelling up the ground surface and filling abandoned channels of the simplified river system.

2.2.2 The Mesolithic

Only limited evidence was discovered for the palaeoenvironmental sequence of the first half of the Flandrian. Useful results were obtained from organic sediment dated to 9220–8260 Cal BC (9370±170 BP; HAR-9243) on the bed of a palaeochannel in trench B141, which had been abandoned not long after the stabilisation of the channel system on the floodplain (Channel E). Gramineae (grasses) followed by Cyperaceae (sedges) predominated among the pollen (A Brown and Keough 1992c, 188), showing that the landscape was still largely open. The most numerous seeds were from *Filipendula ulmaria* (meadowsweet), which was probably flourishing in meadow-like conditions. However, trees were not entirely absent. Buds of *Salix* sp (willow) and a little *Corylus* (hazel) type pollen show that scrub or low open woodland was developing.

There was no evidence for the subsequent stages of woodland succession in the valley bottom. A treethrow hole in the sediments at the edge of Channel E provided some evidence of the composition of the mid-Flandrian (Late Mesolithic) vegetation. The tree stump in the hole was *Quercus* sp (oak) but the other macroscopic plant remains included *Tilia cordata* (small-leaved lime), *Alnus glutinosa* (alder) and *Corylus avellana* (hazel). They probably represent major components of the woodland in the valley bottom prior to Neolithic clearance, the alder tending to grow on the wetter areas of the floodplain and the lime on better-drained gravel. Preserved roots of alder were found in the top of the gravel nearby, which were dated to 4230–3800 Cal BC (5195±65 BP; SRR-3606), the Mesolithic–Neolithic transition (A Brown *et al* 1994, 281–2). Alder root clusters were also found *in situ* in fine sediments at the edge of the West Cotton channel.

Numerous non-waterlogged treethrow holes, which took the form in plan of crescent-shaped, dark soil marks, were observed in all the excavations in the valley bottom. Micromorphological analysis of the soil fill showed evidence of turbation (Macphail and Goldberg 1990; Macphail SS4.8.2), while their origin and structure can be related to the fall of the trees that grew in them (M Robinson 1992b). While it is likely that many treeholes were the results of entirely natural tree fall, some of them showed evidence of burning after soil disturbance, suggesting human involvement in the process of their removal, or at least the burning out of fallen trees.

The present soils of the floodplain are pelo-alluvial gley soils, which developed from weakly calcareous clay that was deposited in the early medieval period. The soils sealed beneath the prehistoric monuments, however, were argillic brown earths of fine to medium loam 0.30m to 0.60m thick over the calcareous floodplain gravels. The evidence from the treethrow holes suggested that some acidification of the brown earth soil had occurred under Mesolithic woodland conditions, with limited clay migration and the formation of weakly argillic brown earth. Full development of the argillic soils post-dated the Mesolithic treethrow pits.

Unlike some treethrow holes recorded in the upper Thames valley, these treethrow holes contained only small quantities of charcoal, even when there were traces of soil reddening caused by burning. This presented two problems: it was not usually possible to identify the tree that created the hole, and the treethrows were difficult to date. A possible explanation for the paucity of identifiable fragments of charcoal is that lime was a major component of the woodland, as lime charcoal rapidly disintegrates on burial in damp soil. Where charcoal concentrations were low, it was possible that the charcoal had been amongst soil that had been incorporated in the hole, perhaps along with artefacts, rather than representing the tree itself.

Of the treeholes that were sampled and their charcoal subjected to radiocarbon dating, one gave a Mesolithic date of 5300–4800 Cal BC (6130±80 BP; OxA-3059) and another a date at the Mesolithic–Neolithic transition, of 4360–3980 Cal BC (5370±80 BP (OxA-3057). Both measurements were made on *Corylus* or cf *Corylus* (hazel) charcoal. Mesolithic flintwork was also recovered from some of the treethrow holes (Panel 3.2). Whether or not any of the treethrow holes were directly associated with Mesolithic activity, these results show that it is likely that the woodland had small openings in it created by fallen trees. There was at least a sporadic Mesolithic presence in the woodland and some burning occurred, although, taking into account the strictures of Rackham (1986, 72), branches would have had to be cut and pulled together before they could be fired.

2.2.3 The Neolithic

There was evidence for interference with the vegetation in the valley bottom during the 5th millennium Cal BC, at, or even before, the elm decline of *c* 4000 Cal BC (*c* 5200 BP). Radiocarbon dates of 4770–4460 Cal BC (5750±45 BP; OxA-7907) and 4460–4050 Cal BC (5455±70 BP; OxA-7958) were obtained on tubers of *Arrhenatherum elatius* ssp *bulbosum* (onion couch grass) from the primary silt of the Segmented Ring Ditch. The Segmented Ring Ditch was of Early Bronze Age date, but these tubers are thought to have been derived from the Avenue, which contained much charred material, as this was cut by the Segmented Ring Ditch. An *Arrhenatherum* tuber, which gave a date almost as early, 4330–3990 Cal BC (5325±50 BP; OxA-7867), was recovered from the southern Avenue ditch itself. *A elatius* is a grass that readily colonises disturbed ground, including abandoned arable, and spreads in grassland provided little grazing is occurring (Pfitzenmeyer 1962). *Arrhenatherum* grassland represents a temporary stage in the succession to scrub and is now very common on roadside verges, but it is eventually shaded out unless scrub is cut. It is also eliminated by heavy grazing. Micromorphological examination of the body of the Long Mound showed it had indeed been constructed of turf. Charred roots of *Corylus* (hazel) from two gullies cut into the top of the Neolithic part of the Turf Mound gave radiocarbon dates of 3950–3700 Cal BC

(5035±35 BP; OxA-7945) and 3910–3660 Cal BC (4975±35 BP; OxA-7865), while the Long Mound was similarly early.

The evidence of the *Arrhenatherum* tubers and the turf structures implies that areas of grassland were present in the valley bottom from almost the start of the Neolithic. The scale of this clearance is uncertain. The Redlands Farm Long Barrow sealed a decalcified brown earth soil, perhaps little different from the Mesolithic soil, with a biologically worked mull horizon. It is argued from the insect evidence that the Long Barrow was constructed shortly after clearance (below) whereas turf would have needed time to develop. An acidic argillic brown earth soil (a soil in which clay had been leached from the upper layer to form a clay-enriched subsoil lower down the profile) had developed at the Long Mound, and the soil beneath it showed some evidence for iron and clay depletion in the Eb horizons and consequent iron and clay enrichment of the Bt horizon. The effect of clearance possibly even led to shallow podzolisation at the Long Mound. It is, however, also possible that the Long Mound was constructed from a Late Devensian dune of blown sand above the fluvial gravels, which had experienced earlier and more extreme acidification.

Detailed evidence for an Early Neolithic open area was provided by waterlogged remains from the ditches of the Long Barrow (Panel 2.2; SS4.2–3). Five radiocarbon dates on organic remains from the southern ditch combine with others from primary contexts to give an estimated construction date of *3800–3640 Cal BC at 95% probability* (3.3.3; Bayliss *et al* SS6). There was some evidence that the immediate environs of the barrow had not long been cleared before the construction of the monument. The lowest sediments of the ditch contained seeds of woodland plants (*Chelidonium majus* (greater celandine), *Silene* cf *dioica x latifolia* (pink campion), *Moehringia trinerva* (three-nerved sandwort), and *Stachys sylvatica* (hedge woundwort) that had perhaps been in soil washed into the ditch just after it was dug. There were also a few examples of large, strong flying beetles, which tend to develop in substantial pieces of decaying wood such as old tree stumps, including *Dorcus parallelipipedus* and *Valgus hemipterus*. The latter species is now extinct in Britain. It is possible that although the area had been thoroughly cleared, there were still some larger tree stumps, which had been left to decay.

The remaining terrestrial insects from the Long Barrow ditch were characteristic of lightly grazed grassland. *Agrypnus murinus*, which has larvae that feed on the roots of herbs in well-drained grassland, was well represented. The pollen from the lower fills of the ditch (pollen zones RF1–RF2) suggested open conditions, with pollen from grasses and other herbaceous taxa predominating. There was good mutually supporting evidence from the pollen and the insects for the vegetation, for example *Plantago lanceolata* (ribwort plantain) was indicated both by pollen and the host-specific weevil *Mecinus pyraster*. Scarabaeoid dung beetles showed that the grassland was being grazed lightly. The soil beneath the barrow had possibly experienced trampling by stock and had its phosphorus level enhanced by animal droppings. Two of these dung beetles, *Caccobius schreberi* and *Onthophagus taurus*, are now extinct in Britain, although the latter has been recorded from other Neolithic and Bronze Age sites.

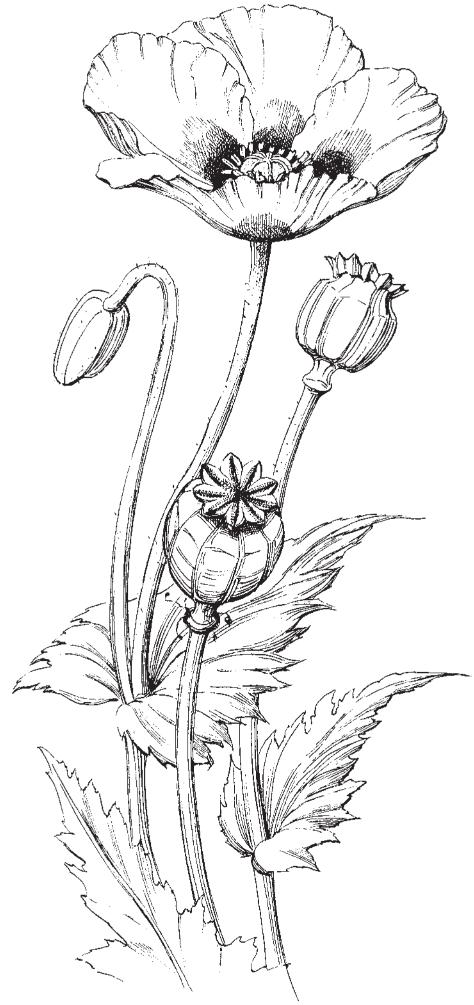
The Long Barrow, however, was set against a background of woodland. Oak leaves blew into the quarry ditches. The pollen, which would have been derived from a larger catchment than the insects, suggested a similar composition to the later Mesolithic woodland, with the main trees and shrubs being *Quercus* sp (oak), *Tilia* sp (lime), *Alnus glutinosa* (alder) and *Corylus avellana* (hazel). There was also a low, but persistent, presence of *Pinus* sp (pine) pollen. Pine is a prolific producer of pollen, which can be carried long distances on the wind. Therefore, there may have been small stands of *Pinus sylvestris* (Scots pine) growing on the more acidic soils, for example on the Ironstone at some distance from the pollen site, rather than in the valley bottom.

Pollen analysis of organic sediments of Late Neolithic date, from a palaeochannel of the River Nene at West Cotton (A Brown and Keough 1992c, 187–9), gave a picture very different from that of the Early Neolithic Long Barrow. The results were from section RAP C, a little downstream from the West Cotton monuments, where macroscopic plant remains associated with a fallen oak trunk gave a radiocarbon date of 3370–2470 Cal BC (4300±150 BP; HAR-9241), and from a short sequence associated with the Neolithic timber platform at West Cotton itself for which three radiocarbon measurements provide an estimated construction date of *2760–2470 Cal BC at 82% probability* (3.4.2; Bayliss *et al* SS6). Tree pollen greatly

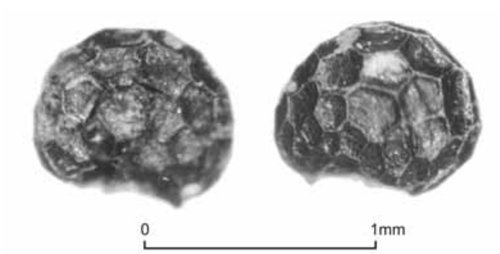
Panel 2.2 Some of the biological remains recovered from deposits in the Long Barrow ditch

Papaver somniferum L (opium poppy)

Eight waterlogged seeds were recovered from sample 170. Opium poppy can grow as an arable weed, but the lack of typical arable weeds from the Long Barrow ditch, and the absence of cereal remains, suggest that this plant may have been a crop in its own right. Opium poppy can be grown for its oil, used as a spice, or medicinally. There are numerous finds from Middle and Late Neolithic sites in northern and central Europe, but this is the first Neolithic record from Britain. Opium poppy was probably first cultivated in the west Mediterranean (Zohary and Hopf 1994, 128–31).

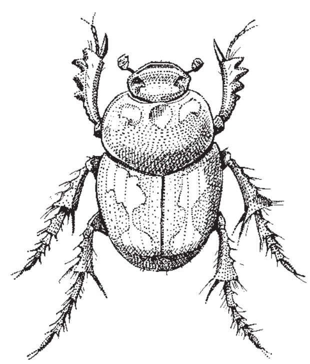


Archaeological specimen   Modern specimen



Head of *Caccobius schreberi* L from sample 131 (context 229)

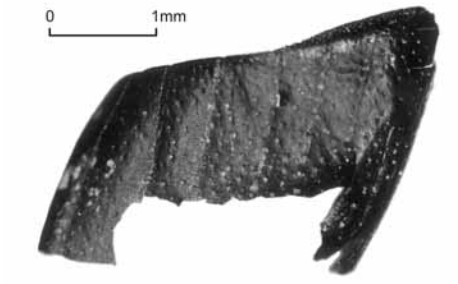
This is one of only three records of this Scarabaeoid dung beetle from Britain, although it occurs throughout most of Europe and is common in Northern France (Paulain 1959, 82).

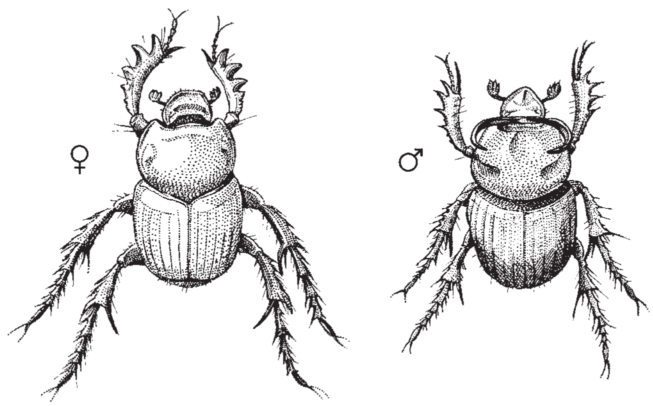


outnumbered pollen of grasses and other herbaceous plants at both sites. Pollen of *Alnus* (alder) predominated, as might be expected given both the high pollen productivity of alder, and the numerous macroscopic remains of alder recovered from these deposits, suggesting an alder-lined river bank. However, pollen of other trees and shrubs, particularly *Quercus* sp (oak) and *Corylus* sp (hazel), was still much more abun-

Right elytron of *Onthophagus taurus* Schreb from sample 187 (context 226/8)

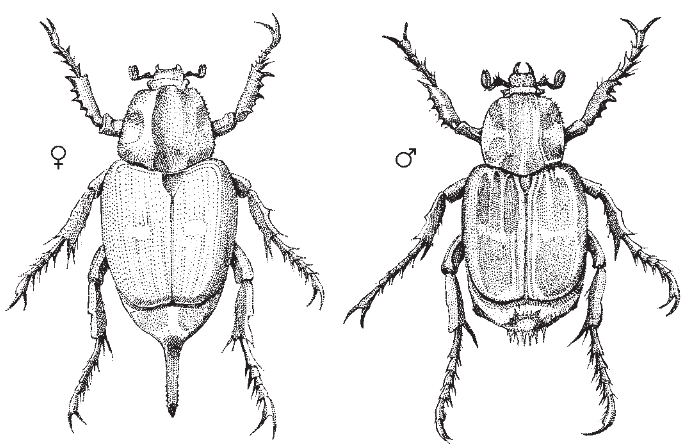
This Scarabaeoid dung beetle is now extinct in Britain, although it has been recovered from a number of Neolithic and Bronze Age sites, including Neolithic deposits at Runnymede Bridge (Robinson 1991, 320). Scarabaeoid dung beetles formed 6.6% of the terrestrial Coleoptera recovered from the barrow ditch deposits, suggesting that there was lightly grazed grassland with some large herbivores.





Left elytron of *Valgus hemipterus* L from sample 130 (context 228)

The larvae of this beetle, which is now extinct in Britain, feed on rotten wood especially in hardwood tree stumps (Koch 1989, 380–1). Two other species of large beetle associated with substantial pieces of rotten wood were also recorded. These beetles may have been living in tree stumps left to decay after clearance.



dant than herb pollen. The macroscopic plant remains added *Tilia cordata* (small-leaved lime) and *Fraxinus excelsior* (ash) to the woodland trees, while underwood or scrubby species included *Prunus* cf *spinosa* (sloe), *Cornus sanguinea* (dogwood) and *Rhamnus catharticus* (purging buckthorn). Seeds of an appropriate range of woodland herbs, including *Mercurialis perennis* (dog's mercury), were also present.

The Coleoptera from the Late Neolithic palaeochannel deposits near West Cotton included major woodland faunal elements. There were species that feed on tree leaves, occur in different categories of dead and decaying wood, prey on caterpillars in the tree canopy and occur in woodland floor habitats, either among leaf litter or feeding on woodland herbs. Some of the more host-specific Coleoptera suggested additional species of tree in the woodland, for example *Scolytus scolytus*, the elm bark beetle. As is typical for Neolithic woodland insect assemblages, Coleoptera that are now very rare or extinct in Britain were present, for example *Gastrallus immarginatus*, which is now restricted to Windsor Great Park.

The pollen and coleopteran results certainly showed that there was much woodland in the catchment of the palaeochannel in the late 4th and early 3rd millennium Cal BC. The pollen was interpreted as reflecting woodland cover on the floodplain (A Brown and Keough 1992c, 188), while the value of seven per cent of the terrestrial Coleoptera belonging to the wood and tree-dependent species group was regarded as indicating between one-third and two-thirds tree cover (M Robinson 2000a). However, there were also at least some open areas. The pollen included *Plantago lanceolata* (ribwort plantain), while the weevil *Mecinus pyraster*, which feeds on *P lanceolata*, was also present. There were other phytophagous Coleoptera of grassland plants and one, *Agrypnus murinus*, which has larvae that feed on the roots of grassland herbs, is characteristic of well-aerated soils. This would be consistent with other evidence that much of the floodplain had well-drained soils and did not experience seasonal inundation during the prehistoric period (Panel 2.1). Scarbaeiod dung beetles were not very abundant, although there were sufficient numbers to suggest the presence of some domestic animals in addition to any wild, medium- to large-sized herbivores that lived in the area.

It is not easy to use the results from the Long Barrow and the West Cotton palaeochannel to construct an environmental sequence for the valley bottom during the Neolithic. The most simple explanation would be that Early Neolithic clearance was followed by gradual woodland regeneration, with the valley bottom becoming largely tree-covered by the Late Neolithic. Some support for this hypothesis was provided by the results from the Long Barrow. The macroscopic plant remains suggested the beginnings of scrub regeneration on the mound itself (2.3.1). The pollen from the barrow ditch sequence showed that although there was a decline in *Tilia* sp (lime), a tree of old woodland with low colonising powers, there was an increase in the pollen of *Alnus* sp (alder), *Quercus* sp (oak) and *Corylus* sp (hazel) up the profile. Evidence for insect-pollinated shrubs of thorny scrub similarly increased.

Developments in the valley bottom, however, were not as simple as Early Neolithic construction of monuments followed by abandonment to woodland. The extensive programme of radiocarbon dating has shown that new Neolithic monuments were constructed and old ones refurbished at least to the end of the 4th millennium, although there seems to have been a lull in the early 3rd millennium, corresponding to the evidence for woodland cover from RAP C and the Riverside Structure (3.4). For example, radiocarbon dates of 3370–3020 Cal BC (4505±45 BP; OxA-7904) and 3370–2910 Cal BC (4480±70 BP; OxA-3055) were obtained on charcoal from the primary fill of the Causewayed Ring Ditch and a date of 3490–2880 Cal BC (4450±90 BP; OxA-3121) was obtained on a red deer antler from a recut to the ditch. The early fill of the recut contained a sparse assemblage of open country mollusc shells. These events occurred long after the initial scrub regeneration at the Long Barrow. The molluscan evidence showed that the Causewayed Ring Ditch was in turn abandoned to scrub regeneration, and woodland species predominated at a higher level in the recut fill. The Long Barrow served as a focus for a Beaker burial and Bronze Age cremation burials more than a thousand years after its construction.

It is also the case that the results from the waterlogged sediments at the Long Barrow and in the palaeochannel are not directly comparable. The Long Barrow ditch was a closed system, so the majority of the pollen and insect remains would have been carried to the deposits by the wind, or in the case of the insects, by their own motive power. The proportion of the remains derived from immediate surroundings is thus likely to be fairly high. The biological remains in the palaeochannel would have entered the river or one of its tributary streams by the same means, but would then have been transported by the water over some distance before being deposited. It is also possible that some of the remains would have been re-worked from material eroded during floods or the normal action of the river within its channel before being deposited at the sampling site. The catchment for the palaeochannel deposits would have been very much larger than the catchment for the barrow ditch, being a strip on either side of the river extending a considerable distance upstream. Thus the results from the barrow ditch tend to give a local picture of the landscape, whereas the results from the palaeochannel give a more regional picture. The barrow could have been set in a clearing while the remainder of the landscape was mostly wooded.

Probably the best interpretation that can be placed on the evidence for the Neolithic landscape is that clearances were made in the valley bottom from the 5th millennium, forming a corridor along which the monuments were constructed. Scrub regeneration appears to have been allowed to occur on individual monuments. However, it is also possible that the corridor was kept open, allowing further monuments to be constructed on the alignment of the earlier ones and preventing the location of overgrown monuments from being lost. The background landscape probably remained largely wooded throughout the Neolithic, although this is not to say that there was undisturbed primary woodland surrounding the Neolithic monument complex at Raunds. Insect evidence from other Neolithic sites, consistent with the results from the palaeochannel, suggests that the Neolithic landscape was composed of a mosaic of different habitats. This mosaic is envisaged as incorporating relatively small clearances, grazed park woodland, abandoned clearances in various stages of scrub to woodland succession, and some relatively undisturbed woodland (M Robinson 2000a).

2.2.4 The Bronze Age

The proliferation of Beaker to Early Bronze Age monuments on Irthlingborough island suggests that progressive clearance was occurring in the valley bottom. Unfortunately, organic sediments dating to the first half of the Bronze Age were absent. Investigation of the buried palaeosols beneath the Irthlingborough barrows and the south end of the Turf Mound showed them to be argillic brown earth soils (moderately acidic soils with clay-enriched lower horizons). The turves of the south end of the Turf Mound were from acid pasture with moder humus (loose, crumbly still-acid humus in which plant material is incompletely broken down), suggesting that some areas had become more acidic. There was evidence for soil disturbance, possibly from the trampling of domestic animals, rather than stable turf. However, any Bronze Age cultivation was shallower than ploughing around the barrows in the Iron Age and Roman periods. The soil sealed beneath the barrows was stone-free, unlike the surrounding ploughsoils, in which cultivation had extended into the underlying sand and gravels. Further examples of charred tubers of the grass *Arrhenatherum elatius* var *bulbosum* (onion couch), some of which were associated with cremation burials, suggest the availability of ungrazed, or lightly grazed, grassland.

Just as in the Neolithic, some scrub regeneration seems to have occurred on monuments in the Bronze Age. Radiocarbon dates of 2140–1880 Cal BC (3650±45 BP; OxA-7903) and 2130–1820 Cal BC (3610±40 BP; OxA-7949) were obtained on *Rhamnus catharticus* (purging buckthorn) and *Prunus* sp (sloe) charcoal from the ditch fills of Barrow 3. It had perhaps been derived from scrub cutting on the monument. At least one of the other barrows had trees growing on it: radiocarbon dates of 2290–1880 Cal BC (3685±65 BP; OxA-6404) and 2200–1740 Cal BC (3610± BP; OxA-6403) were obtained on *Alnus* (alder) root clusters from the southern ditch of the Long Barrow. It is possible that the scrub cutting at Barrow 3 was part of a more general refurbishment of the monuments in the valley bottom, because the dates on the charcoal overlap the radiocarbon dates of inhumations inserted into the Long Barrow (Figs 3.31, 3.67).

A small organic deposit from the palaeochannel at West Cotton was dated to the Early to Midddle Bronze Age by optical stimulated luminescence (OSL) with a date of 1680±210 BC (IRSL-792d), calculated as 2100–1260 BC (Rees-Jones 1995, 81–5). The overall impression from the insect evidence is that the Late Neolithic landscape, which was perhaps a mosaic of wooded and open areas with of the order of 30% to 60% tree cover, had by then largely been cleared of trees. Grassland insects were well-represented. Scarabaeoid dung beetles were present, but equally abundant were phytophagous beetles, which feed on grassland plants and flourish best under conditions of little or no grazing. It seems likely that much of the catchment was relatively lightly grazed grassland. Seeds of grassland plants from the deposit confirmed the evidence of the insects (2.6.2).

Such conditions probably prevailed at least until the use of the ceremonial complex came to an end. The most recent radiocarbon date for the complex was 1370–1000 Cal BC (2950±50 BP; OxA-3089), on *Arrhenatherum* tubers from a cremation deposit that had been cut into the periphery of Barrow 1 some time after the final enlargement of the monument.

The laying out of a field system in the valley bottom suggests that the landscape was re-organised around agricultural production rather than ceremony. Unfortunately, the field system is undated, but it is thought likely to have been Midddle or Late Bronze Age, when the monument complex was falling out of use (3.7.2).

2.3 The monuments in their setting

The only detailed evidence regarding the nature of the immediate surroundings of the monuments is provided once again by the waterlogged deposits in the ditches of the Long Barrow. Molluscan remains recovered from the recut of the Causewayed Ring Ditch give some indication of the nature of the environmental history of this monument, while charcoal spreads found in the ditch fills of Barrow 3 point towards possible refurbishment or maintenance of this monument.

2.3.1 The Long Barrow

As discussed above (2.2.3) there was some evidence that suggests that the Long Barrow may have been constructed in a recently cleared area. However, the environmental evidence indicates that, once built, the barrow ditches remained full of water throughout the year, while the mound itself was initially bare of vegetation, becoming invaded by plants of disturbed ground. *Ranunculus* subgen *Batrachium* (water crowfoot), *Potamogeton* sp (pondweed), and *Glyceria* sp (flote grass or reed grass) grew in the ditch. Pond skaters skimmed the surface, and the water beetles *Helophorus* cf *brevipaplis* and *Ochthebius minimus* were common. On the mound, weeds of bare sandy soils – such as *Aphanes arvensis* (parsley piert), *A microcarpa* (slender parsley piert, *Arenaria serpylifolia* (thyme-leaved sandwort), and *Polygonum aviculare* agg (knotgrass) – became established along with beetles, which could have fed on these plants.

As the ditch silted up, plants associated with bare mud increased in abundance, for example *Ranunculus sceleratus* (celery-leaved crowfoot), while beetles that occur on bank-side mud were also present, for example *Hetercerous* sp, *Sphaerius acaroides*. At the same time, the rise in the numbers of *Potentilla reptans* (creeping cinquefoil) in samples from this level in the ditch suggests that the mound became grassed over. Eventually both the mound and the ditch became overgrown. Herbs such as *Verbena officinalis* (vervain) and *Hypericum* sp (St John's wort) were found in the topmost sample along with the shrubs *Cornus sanguinea* (dogwood), *Prunus spinosa* (sloe), *Sambucus nigra* (elder) and *Rubus fruticosus* agg (blackberry). A radiocarbon date of 3760–3370 Cal BC (4810±80 BP; OxA-3001) was obtained on waterlogged seeds from this part of the sequence, suggesting that this regeneration was occurring only a few decades after the construction of the barrow.

Outside the immediate area of the monument the Coleoptera indicate the continued presence of lightly grazed grassland. Scarbaeoid dung beetles accounted for 6.6% of the terrestrial Coleoptera. This is sufficiently high to indicate the presence of large herbivores but is not so high as to suggest heavy grazing. Tall umbellifers were absent from the samples, which suggest that grazing pressure was high enough to ensure they did not become established.

Radiocarbon dates on two *Alnus glutinosa* (alder) root clusters show that the Long Barrow eventually became covered with trees. The alder roots were found growing through the organic fills of the ditch, and date to a thousand years or so later than the main body of material (Fig 3.31).

2.3.2 The Causewayed Ring Ditch

The molluscs from a single deposit in the recut of the Causewayed Ring ditch (Fig 3.47) indicate that at this time the monument was situated in open conditions. Higher up the recut profile, both open country species, such as *Vertigo pygmaea* and *Vallonia excentrica*, and shade loving species, such as *Carychium tridentum* and *Aegopinella pura*, were present, possibly indicating the presence of ungrazed grassland. The final sample from the recut contained large numbers of molluscs, nearly all of which are characteristic of woodland. The results from this topmost sample would suggest that regeneration of woodland took place in the vicinity of the monument between fifty and a hundred years after the ditch was recut.

2.3.3 Barrow 3

Samples from two charcoal spreads in the ditches of Barrow 3 contained species indicative of scrub. The assemblages probably represent the burning of this vegetation, which had established itself on or around the barrow, either in connection with the recutting of the ditch in a deliberate effort to maintain the monument, or as the result of fires made from the most convenient supply by visitors to the monument.

2.4 The deposition of animal bone

2.4.1 The Barrow 1 cattle cairn

A large deposit of animal bone was found overlying, and mixed with, the limestone blocks that formed part of the mound of Barrow 1. The cairn had slumped into the void left by the collapsed timber roof of a central burial chamber, which contained a single adult male inhumation dated to the Beaker period (Figs 3.96, 98–100). The animal bone deposit consisted almost entirely of cattle bones, the vast majority of which were skulls. The deposit was clearly part of some kind of ritual, almost certainly related to the burial of the man interred beneath it (S Davis and Payne 1993; Panel 4.3; Davis SS4.6.1).

Study of the assemblage by S Davis and S Payne (1993) suggested that, in its original form, the deposit probably contained 185 cattle skulls, along with the skulls, mandibles, scapulae and pelves of a further forty cattle and at least one aurochs. Most of the cattle were young adults of between one and six years old. There were no very old individuals, and only one calf. Thus the cattle were of prime beef age and butchery marks on the scapulae would suggest that the meat from them was eaten. However, the under-representation of premolars and incisors in the assemblage (only one incisor was found of a possible 272) suggests that the skulls were placed on the cairn sometime after they were killed. This is because it is the incisors and premolars that most readily fall out of the jaw once the flesh has decayed.

S Davis and S Payne (1993) suggest two possible courses of events that could have lead to the creation of the deposit. It is possible that the cattle were killed and that there was large-scale consumption of meat in ceremonies taking place close to the barrow over a relatively short time period. The skulls and some bones were then stacked to one side for a few weeks or months before being placed on the stone cairn and buried. A second possibility is that only forty or so cattle were killed and eaten at the barrow. The rest of the skulls could have been brought to the cairn as tokens, the cattle having been killed and eaten at ceremonies elsewhere. This latter scenario might in part explain the spread of radiocarbon dates obtained on teeth from this deposit. While this deposit is almost unique in Britain, 19th-century reports record the association of cattle skulls with human remains in barrows, and the mound sealing the primary burial in an Early Bronze Age barrow at Gayhurst Quarry, Buckinghamshire, seems to have been covered or edged with large quantities of cattle bone, among which the larger limb bones predominated (Chapman *et al* 1999; Chapman 2004; Chapman forthcoming b). The symbolic importance of cattle to builders of this and other monuments is evident (4.4). It adds weight to the argument put forward by Grant (1991, 111) that cattle husbandry in the Neolithic and Bronze Age may have had as much to do with the need to produce animals for sacrifice, and to demonstrate status, as it did with the production of milk and meat.

2.4.2 The Riverside Structure

The limb bones of mainly juvenile and subadult cattle dominated a smaller, probably rather earlier, assemblage lodged in the upper part of a Late Neolithic wooden platform built at the edge of a palaeochannel of the Nene (Baker SS4.6.4), in which there were also two human femur fragments (Mays SS4.7.2). The predominance of the more robust bones, and the scored, fragmented state of material are consistent with abrasion by grit, stones or branches in the river and suggest that the deposit was subjected to heavy attrition. It is possible that more of the skeletons, even whole bodies, were originally placed in the river, but it is not possible to determine if the assemblage results from a single depositional event or if it consists of a gradual accumulation of waste.

2.4.3 Barrow 3

A horse mandible from Barrow 3 (Davis SS4.6.2) was built into the first mound, near the centre. As virtually no other animal bone was present, this has the appearance of the deliberate incorporation of a fragment from a species that is rare in Early Bronze Age contexts. Unfortunately, the uncertain date of the find impedes secure interpretation of its significance.

2.5 Cremation deposits and the use of wood in cremation ritual

Gill Campbell

The amount of wood needed to cremate a human body has been estimated by various means and by various authors. A likely quantity is 300–500kg (McKinley 1994, 80), although the amount may vary according to the status of the deceased and the wood supply (McKinley 2000, 407). In addition to the wood, grass, small sticks and other material are used as kindling (McKinley 1994, 80). The vast majority of the charcoal present following a cremation will have derived from the pyre itself (McKinley 1994). A very small amount may be derived from items placed on the pyre, such as wooden bowls or knife handles.

The range of taxa present in an archaeobotanical assemblage from a cremation deposit will depend on its exact nature. Pyre debris is likely to contain more types of wood than burials of bone collected from the pyre. Gale (1997, 82) has pointed out that pyre debris may contain the remains of more than one pyre, and so cannot be used to infer the use of particular woods for a single cremation. Charcoal found in cremation burials, on the other hand, may have been hand-picked from the pyre along with the bone selected for burial. Alternatively, it may have been caught in sieves along with larger fragments of bone, following the breaking up of the skeleton and the sieving of the remains. Either method of retrieval will result in only larger charcoal fragments being represented in the burial. Thus the main supporting timbers of the pyre may be present in such contexts, but not the smaller brushwood. Nevertheless, charcoal retrieved from burials is more likely to derive from a single pyre, and may therefore be used to answer questions concerning the use of wood in a single cremation.

Pyre construction may also affect the types of charcoal recovered from cremation deposits. Pyres can be built on a flat surface or over a pit or a scoop in the ground (McKinley 1994; 2000). In the latter case, it seems probable that the pyre would eventually collapse into the pit and that the recovery of material for burial would have been more difficult, involving the raking or digging out of the pit. A pit would also result in more reducing conditions, favouring the production of charcoal as opposed to ash during the burning process. Thus a pyre built over a pit might be expected to produce larger charcoal assemblages of greater diversity and containing more small-diameter roundwood than one built directly on the ground surface.

Tubers, roots and rhizomes have often been noted in cremation deposits. Tubers have been interpreted as the remains of food offerings (Jones 1978, 107) or kindling (M Robinson 1988). Tubers along with roots and rhizomes may also indicate the use of turves as fuel for the pyre. However, the prevalence of this type of material may reflect the digging of a pit prior to the construction of the pyre, as, once exposed in the pit sides, the roots and underground parts of the plants would become charred during the cremation process. Furthermore, where grasses and herbs were used as kindling, or tubers were present as food offerings, this material would have a better chance of survival in pits, where the conditions would be more likely to be reducing. Regardless of pyre type, tubers and the remains of grasses and other plants should be more common in deposits of pyre debris than in burials.

A tendency for cremation deposits to be dominated by a single taxon has been taken as an indication that ‘one type of wood was deliberately chosen for the funerary pyre’ (Thompson 1999, 253), even that the choice may have had ritual or magical significance (Challinor 1999; Gale 1997; Thompson 1999). For the reasons outlined above, it seems reasonable to suppose that, where one type of charcoal is dominant in an assemblage, this represents the wood used to form the support structure (McKinley 1994). Smaller proportions of charcoal from different species are likely to be the remains of brushwood infill or pyre goods. Choice of fuel would also have been influenced by availability and by practical considerations. Timber would need to be large enough to provide a firm supporting structure. Wood that burns at a high temperature, such as ash and oak, would be preferable to woods such as elm and alder, which burn slowly and give out relatively little heat (Gale 1997).

Local woodland composition, or the availability of old timber from buildings and so forth (Gale, 1997, 82) would also play a part.

The results from those cremation deposits at Raunds that produced moderate amounts of charcoal are summarised in Table 2.1. In several, only a single taxon was recorded. However, the two assemblages from Barrow 1 are rather mixed. Tubers and other plant remains, especially the seeds of small legumes, are associated with charcoal assemblages that contained more than one taxon (with one exception – the Neolithic infant cremation burial from the Long Mound). The results contrast somewhat with those from other sites such as Barrow Hills and the Rollright Stones, both in Oxfordshire (Straker 1988; Thompson 1999), and Dorney, Buckinghamshire (Challinor 1999), where either there was only one type of wood in a cremation or a single wood type predominated.

One explanation for the mixed charcoal assemblages recovered from Barrow 1, and for the presence in them of tubers and other plant remains, is that the deposits are pyre debris rather than from cremation burials. It might further be argued that these remains are from pyres constructed over pits rather than directly on the ground surface. The same considerations may explain the assemblage from the bottom layer of F47168, cut into the centre of Barrow 5, which contained charred tubers, legumes, grain and other plant remains very similar to the charred plant remains in the cremation deposits (Campbell SS4.5.4).

At Barrow Hills and at Field Farm, Burghfield, Berkshire, tubers were recovered from cremation pits that contained more than one type of wood charcoal (Carruthers 1992; Gale 1992; Moffett 1999). By contrast, no tubers were found at Dorney, where a single type of wood predominated in all the cremation deposits (Challinor 1999).

Several questions need to be considered when interpreting the Raunds results, above and beyond the constraints imposed by deposit type.

Does the type of type of wood used reflect changes in local woodland?

In Barrow 6 at Raunds, a cremation deposit dated to the late 3rd or early 2nd millennium contained Pomoideae-type charcoal (apple, hawthorn, service tree, etc), while one dated to the mid-2nd millennium contained only oak (Table 2.1). Yet oak would be more typical of undisturbed or primary woodland, while the Pomoideae from the earlier cremation burial would be more typical of woodland that has regenerated following clearance. Similarly, at Field Farm, late 3rd- to early 2nd-millennium cremation deposits contained scrub species and a late 2nd- to early 1st-millennium cremation deposit contained only oak (Gale 1992). A sequence from wood indicative of regeneration to wood more typical of primary woodland at both sites would suggest that the wood chosen for cremation did not mirror the development of local woodland.

Is use of a particular type of wood associated with a specific monument?

The cremation deposits from the Long Barrow were all dominated by oak, while the two cremation deposits from Barrow 1 were rather mixed. Of the two cremation deposits from Barrow 6, one contained oak, the other Pomoideae-type charcoal. Similarly, the absence of tubers, roots and rhizomes at the Long Barrow might indicate that at this site pyres were constructed directly on the ground surface rather than over a pit. Thus there is some evidence that a particular type of wood or cremation practice might be associated with a particular monument. A somewhat similar pattern occurred at the Rollright Stones, Oxfordshire (Straker 1988). Oak was associated with the Round Cairn and hazel with the Bronze Age Round barrow, although in the case of the Round Cairn the material is probably derived from only a single event.

Is use of a single wood type a reflection of status?

All the cremation deposits from the Long Barrow were dominated by oak, both those contained in urns and those without associated artefacts. At Barrow Hills, a cremation deposit of a young adult, possibly female, associated with a bronze awl and a ceramic bead produced a mixed charcoal assemblage of Pomoideae-type charcoal and oak (A Barclay and Halpin 1999, 48; Thompson 1999, 258) whereas the other cremation deposits were dominated by oak. These results suggest that status is not reflected in the use of a particular type of wood.

Do the wood varieties chosen vary with sex and/or age?

Table 2.1 suggests that, at Raunds, children tend to be associated with a number of different woods, and infants and adults with a single species. The picture from Barrow Hills is somewhat similar. It is the cremation

Table 2.1 Charcoal and charred plant remains from cremations in relation to sex, age, date and accompanying artefacts

◆ = main charcoal type ■ = subsidiary charcoal type ● = charred plant remains

Date or period	*Monument*	*Feature*		*Oak*	*Ash*	*Hawthorn type*	*Hazel*	*Maple*	*Rose*	*Prunus*	*Tubers*	*Grain*	*Small legumes*	*Blinks*	*Grasses*	*Associations*
RAUNDS																
Infant	Neolithic	Long Mound	F5549	◆							●	●				2 flakes, chip, blade, core fragment, core, indeterminate sherd
Infant	2130–1820 cal BC	Barrow 6	F3219			◆							●			Small Collared Urn, burnt animal teeth
Infant	1750–1510 cal BC	Barrow 6	F3206/ 3226	◆												
2–5 years	1390–1120 cal BC	Barrow 1	F30307	◆	■		■				●		●	●	●	
2–6 years	1370–1000 cal BC	Barrow 1	F30030		◆	■		■	■		●		●			
Adult male, subadult	1860–1420 cal BC	Long Barrow	F208/B	◆												Indeterminate sherd
Adult, subadult	MBA	Long Barrow	F198/B	◆												Bucket Urn
Adult	MBA	Long Barrow	F106/B	◆		■										Bucket Urn
Adult	MBA	Long Barrow	F110	◆												
Adult ?male, possible subadult	MBA	Long Barrow	F201/B	◆		■										
BARROW HILLS																
2–3 years	2040–1620 cal BC	Ring ditch 611	611/D/2A	◆						■						Early Bronze Age urn
Young adult, ?female	1940–1530 cal BC	Ring ditch 801	802	■		◆					●				●	Bronze awl, ceramic bead
17–23 years	2470–2030 cal BC	Barrow 12	605/1	◆												
Adult male	2040–1680 cal BC	Barrow 1	11	◆				■					●	●		Bronze knife-dagger, bone tweezers and pin, all possibly in organic container

burial containing the possible female where oak is not the dominant taxon.

Whether the choice of wood relates to ritual or to the practicalities of burning different corpses remains unclear. The ratio of surface area to volume in a body must be an important factor in determining how readily it will burn, as it is necessary to drive off most of the water before the body will ignite. The amount of body fat will also play a part. Thus females and children might be easier to burn than adult males and infants, so that oak, a high-temperature fuel, might be reserved for those bodies that would be most difficult to burn.

Overall, the limited data from Raunds could be taken to indicate that some pyres were constructed over pits and that cremation practice may have varied at different monuments. Furthermore, the choice of wood appears to have been influenced by the age of the person being cremated. However, much more work is needed before we can truly begin to understand the use of fuel wood in cremation rites. There are still very few charcoal reports on cremation deposits, and even fewer where the nature of the deposit has been identified as of a particular type. Careful sampling and recovery of charcoal from different types of cremation deposits is needed in conjunction with the high-quality reporting on human bone seen in many recent reports (eg McKinley 1997a).

2.6 Farming?

2.6.1 The evidence for farming in the Neolithic

The environmental evidence for the use of the valley floor in the Neolithic comprises work on soils, as well as pollen, insects and waterlogged plant remains from the Long Barrow ditches and from deposits of later Neolithic date within palaeochannels. There is also is a small assemblage of charred plant remains from a Grooved Ware pit, and a small deposit of animal bone within the palaeochannel at West Cotton.

The pollen evidence, while it indicates a partially cleared landscape (2.2.3), does not suggest cereal agriculture. Although cereal-type pollen was recovered from the Long Barrow ditch (Wiltshire SS4.2), the presence of *Glyceria* sp (flote grass or reed grass) macrofossils in samples from the lower fills – the pollen grains of which overlap in size with those of cereals – suggests that it is this genus rather than cereals that is present.

Similarly, no cereal-type pollen was recorded in Neolithic palaeochannel deposits (A Brown and Keough 1992c, 188, fig 18.3). The cereal-type pollen recorded from the centre of the West Cotton palaeochannel is almost certainly Saxon. The only other record of prehistoric date comes from the palaeochannel in trench B141. As this channel has been dated to 9220–8260 Cal BC, it is highly probable that this latter record also represents wild-grass pollen of *Glyceria* sp.

The insect assemblages from both the Long Barrow ditches and the palaeochannel deposits give a good indication that the monuments stood within a partially cleared landscape, which included lightly grazed grassland (2.2.3). Scarbaeoid dung beetles of species group 2 reached 3% of the terrestrial Coleoptera in the West Cotton palaeochannel deposits, while the value from the Long Barrow ditch was 6.6%. These values are sufficiently high to imply that domestic herbivores were herded on the floodplain. However, it is possible that one of the main purposes of grazing animals within the ceremonial complex was to help maintain the open conditions. The small Neolithic bone assemblage from the West Cotton channel deposits consisted mainly of cattle with caprine, pig, red deer and duck also present. Many of the cattle bones were from juvenile or subadult animals, suggesting that cattle were raised locally (Baker SS4.6.4).

Apart from weeds of disturbed ground that colonised the Long Barrow mound, the only other macrofossils from the Long Barrow ditch that might indicate that crops were grown in the vicinity of the monument were seeds of *Papaver somniferum* (opium poppy). Opium poppy is not native to Britain and it must have been introduced, either intentionally or unintentionally, by humans. This early record shows that it was already present by the early 4th millennium Cal BC. Other records from Northern Europe also date from around this time (Panel 2.2; Zohary and Hopf 1994, 130). The poppies probably grew as weeds on the mound, but they may have been cultivated, either at this location or elsewhere. Apart from providing opium, the seeds of this poppy may be used as a spice or as a source of oil. The pressed seeds make excellent cattle cake, while the leaves can be used as fodder for pigs (Crawford 1973, 230).

The only charred assemblage producing cereal remains that could not be readily attributed to later Roman or medieval activity came from the Grooved Ware pit (Ch 3.4: F31820). As well as remains of *Prunus spinosa* (sloe), *Malus* cf *sylvestris* (crab apple), and *Corylus avellana* (hazel) nutshell, a single *Triticum* sp (wheat) grain and indeterminate cereal grain were recovered from samples from this feature. This cereal however could have been brought from some distance for use in the activity or activities that produced these very distinct assemblages.

Overall, the evidence suggests that while herding of domestic animals took place on the floodplain, the area was not used for growing cereals or other crops. Cereals do seem to have been a usual part of the Neolithic diet in England (Moffett *et al* 1989; M Robinson 2000b), and it is likely that this was also true at Raunds. Cereal plots may have existed, along with more settlement activity, on the valley sides. However, this cannot be established on current knowledge of the archaeology of these areas.

2.6.2 The evidence for farming in the Bronze Age

The earliest evidence for farming in the Bronze Age, apart from that obtained from soil micromorphology, comes from the cairn overlying the Beaker burial in Barrow 1 (2.4.1), clearly indicating the importance of cattle to the builders of these monuments. Later evidence comes from a small deposit within the West Cotton palaeochannel, dated to the Early to Middle Bronze Age by OSL with a date of 1680±210 BC (IRSL-792d), calculated as 2100–1260 BC (Rees-Jones 1995, 81–5). The final piece of evidence, apart from the undated field system itself, comes from an assemblage of emmer wheat found in a posthole that formed part of a fence associated with a Bronze Age structure.

Insects from the possible Bronze Age deposit suggest a largely pastoral landscape. Grassland insects were plentiful, with *Scarabaeoid* dung beetles accounting for 7% of the terrestrial Coleoptera. Wood- and tree-dependent beetles were almost entirely absent. Plant macrofossils included *Ranunculus* subgenus *Ranunculus* (buttercups), *Linum catharticum* (purging flax), *Potentilla anserina* (silverweed), and grasses, indicating grassland and suggesting grazed pasture. *Juncus bufonius* gp (toad rush) was also present, suggesting that trampling was occurring close to the channel. Some weeds of disturbed ground were also recovered. These could have been growing on bare ground at the edge of the river and on patches of trampled ground and are not necessarily indicative of arable agriculture, especially in the absence of cereal remains.

Overall, the somewhat limited evidence of Bronze Age date would suggest that the valley bottom developed as pastoral landscape from the Neolithic onwards. The layout of the field system, with what look like droveways, suggests stock-raising as the main determinant (Fig 3.122), rather than cultivation. This picture would fit with the results from sites such as Yarnton and Perry Oaks in the Thames Valley. Perry Oaks had a field layout similar to that at Raunds (Barrett *et al* 2001, fig 2), while the environmental evidence from both sites, especially the insects, points to the importance of the pastoral economy (M Robinson in prep). Mixed arable agriculture may have become significant only in the Late Bronze Age. The presence of a single free-threshing wheat rachis and a single wheat grain of free-threshing type in an Early Bronze Age context at Barrow 5, and the odd finds from the Southern Enclosure, might imply that free-threshing wheat was grown in the area during this time. However, without substantial assemblages of charred cereal remains, and taking into account the possibility that these finds could be the result of intrusion, the evidence remains inconclusive.

A charred assemblage of emmer wheat, associated with a Bronze Age hut, and dated to 1110–830 Cal BC (2815±40 BP; OxA-7905) and 1050–830 Cal BC (2795±40 BP; OxA-7946), provides the first substantial evidence for the growing of cereal crops in the area. However, given that this assemblage consists almost entirely of grain, mainly wheat with a little barley, and a few weed seeds, it is possible that it was brought to this location fully threshed. The fields where cereals were grown may still have been located away from the floodplain on the valley slopes or elsewhere.

2.7 The environmental studies in their regional and national context

The palaeoenvironmental studies in the valley bottom at Raunds are some of the most extensive undertaken on a complex of monuments spanning most of the Neolithic and Bronze Age. There are many examples of individual monuments or small groups of monuments with good potential for environmental archaeology that have been studied in detail. However, it is probably only in some of the studies in Wessex – for example in the Avebury or Stonehenge areas (eg Cleal *et al* 1995) – that such a wide range of techniques has been applied to even larger blocks of prehistoric ceremonial landscapes. The work was far beyond the scale of anything that had previously been undertaken in the Nene Valley. Probably the most similar monument complex to have been investigated on the river gravels of England was Barrow Hills, in the upper Thames valley (M Robinson 1999). The monuments at both sites were situated on well-drained limestone gravel, which mostly had a covering of circumneutral soil, giving the same constraints of preservation on biological remains. Nearby waterlogged sediments were also available to give a regional environmental picture, although the evidence from Barrow Hills was limited to pollen and Raunds did not have the long sequence spanning most of the Neolithic and Bronze Age that was available there. The monument complex at Barrow Hills, which extended for about 1.25km, covered a smaller area than the Raunds complex, which extended for about 3.5km.

The vegetational sequence in the valley bottom at Raunds during the first half of the Flandrian was unexceptional, with the establishment of mixed woodland comprising oak, lime, hazel and alder by the later Mesolithic. Both Raunds and Barrow Hills experienced clearance at the start of the Neolithic, perhaps even before the elm decline of around 4000 Cal BC (*c* 5200 BP) at Raunds. The ceremonial complex at Raunds was then used throughout the Neolithic and up to the Late Bronze Age, the latest activity being around 1200 Cal BC (*c* 3000 BP). During the later Neolithic, however, woodland regeneration had occurred over some of the monuments. There are plenty of other examples of the Late Neolithic woodland regeneration over earlier monuments, for example on the gravel of the River Ouse at the Godmanchester cursus (M Robinson 2000a). Late Neolithic woodland regeneration also occurred on some long barrows in the Avebury area (J Evans 1990). The sequence based on molluscan evidence from the Easton Down long barrow was of Early Neolithic deforestation, Midddle Neolithic maintenance of open conditions and Late Neolithic abandonment (Whittle *et al* 1993). At Raunds, however, the evidence can perhaps best be interpreted as individual monuments experiencing episodes of scrub regeneration without necessarily implying more general regeneration. The pollen from Barrow Hills showed that the gravel terrace remained open after the initial clearance, but molluscan evidence suggested local scrub regeneration on monuments in the later Neolithic and in the Late Bronze Age. Another ceremonial site with which comparisons can be made is the Early Neolithic causewayed enclosure at Etton, on the gravels of the lower Welland near the edge of the Fens (Pryor 1998a). As at Raunds, the pollen and insect evidence suggested monument-construction in an open environment against a background of a more wooded landscape (M Robinson 1998; Scaife 1998). However, the site remained open throughout the Midddle and Late Neolithic, with only limited scrub regeneration at the end of the Midddle Neolithic (Nye and Scaife 1998).

The prehistoric soil evidence from beneath the monuments was particularly useful in showing the surface decalcification of the soil above floodplain gravel, even though limestone was a major component of the gravel. This tendency had already been observed on other sites on river gravels (M Robinson 1992b, 42), including Barrow Hills (M Robinson 1999). The Raunds results gave more details of this development and showed it to have been more extreme than anticipated.

The occurrence of charred tubers of *Arrhenatherum elatius* var *bulbosum* (onion couch grass) in both Neolithic and Bronze Age contexts might imply that the monuments at Raunds were situated in grassland that was no more than lightly grazed. Dung beetles from the ditch of the Long Barrow showed that some domestic animals were present and there was evidence from the buried soils beneath some of the monuments, including the Long Barrow, for trampling by stock. A very high level of dung beetles indeed was recorded from an Early Neolithic pit just inside the Etton causewayed enclosure (M Robinson 1998). In contrast, the very low level of dung beetles from the Godmanchester cursus, might be taken to suggest that grazing was discouraged around the monument (M Robinson 2000a). There is molluscan evidence from Avebury that there were episodes when the grassland of the monument complex was not grazed (J Evans *et al* 1985).

The Neolithic and Bronze Age environmental sequence at Raunds can best be summarised as follows. Very early Neolithic clearance took place in the valley bottom, perhaps to create a corridor of grassland within which the alignment of monuments was situated, against a largely woodland background. An episode of scrub regeneration occurred, at least on individual monuments, in the Early Neolithic. There was perhaps more general regeneration during the Late Neolithic, when there was a hiatus in monument-building. However, the alignment was never entirely lost, for new monuments were constructed and old monuments refurbished along it. More extensive clearance occurred in the Early Bronze Age, and by the Midddle Bronze Age the valley bottom presented an open landscape. The Bronze Age open landscape seems predominantly to have been grassland and may have remained so even after the monuments had fallen out of use around 1200 Cal BC (*c* 3000 BP), to be replaced by a ditched field system. This sequence is similar to that recorded for the Thames Valley, where, although some areas were cleared at a very early date, much woodland remained throughout the Neolithic (M Robinson 1992b, 51). Early and Middle Bronze Age monuments on the Thames gravels seem to have been set in lightly grazed grassland, with major clearance of the main valley coming after the Neolithic and before the Late Bronze Age. The Thames valley also sees the laying out of small areas of field system in the Midddle or Late Bronze Age.

The evidence for animal and plant food resources from Raunds followed the sequence recorded elsewhere for the river gravels of the Midlands and Southern England (M Robinson 1992b). Bones of domestic animals outnumbered bones of wild animals, but collected remains of woodland food plants, particularly hazel nuts, greatly outnumbered cereal grain. This appears to be the usual pattern at such sites in England during the Neolithic (Moffett *et al* 1989; M Robinson 2000b). The first evidence for possible mixed agriculture at the site comes from an assemblage of emmer wheat dated to the Late Bronze Age. This also fits in well with the general picture that shows that cereals became increasingly important from the Midddle Bronze Age onwards. Spelt wheat is recorded in pits at Godmanchester dated to 1680–1400 Cal BC (3240±50 BP; GU-5213) and is the predominant wheat at some sites in Essex in the Late Bronze Age (N Brown and Murphy 1997, 18). Spelt wheat is also common in assemblages from the Thames valley, in contrast to the evidence from the Kennet valley, where emmer is more prevalent (Campbell forthcoming). The very limited evidence from Raunds might suggest a similar pattern to that found in the Kennet valley for the upper Nene valley. The earliest dated assemblages of spelt wheat from Raunds are Iron Age (Campbell in prep).

The evidence from Raunds makes an important contribution to the study of Bronze Age cremation practice, with the possibility that pyres were constructed over pits. The work clearly shows the need for further study of charcoal from pyre-related deposits of this date.

Several unusual and important discoveries were made. These included waterlogged sediments in the base of the ditches of the Redlands Farm Long Barrow and the cairn of cattle bones, particularly skulls, which overlay the central burial of Barrow 1. There are examples of waterlogged sediments from long barrow ditches in the East Anglian fens (for example, Haddenham), but they resulted from water-table rises after the monuments had fallen out of use. The deposits at Redlands Farm were contemporaneous with the construction of the barrow. Not only did they provide useful palaeoenvironmental information on the setting of the monument, they also contained the first Neolithic examples of *Papaver somniferum* (opium poppy) seeds to be discovered from Britain. The bone cairn, which contained nearly 200 cattle skulls, was possibly unique in Britain and provided a major assemblage of bones for study (S Davis and Payne 1993).

The palaeohydrological evidence that emerged from the excavations serves as a reminder that major changes have occurred on some floodplains. While the early medieval village of West Cotton existed precariously behind its flood defences, with an ever-rising level of alluvium in front of them, the Neolithic and Bronze Age monuments of the valley bottom faced no such threat. It must also be appreciated that the excavation of the alluvium at Raunds did not reveal an intact prehistoric landscape. Rather, it exposed an early medieval land surface in which the prehistoric archaeology had experienced degradation brought about by cultivation prior to the onset of extensive flooding.

There are still very few sites in the east Midlands where palaeoenvironmental sampling has occurred on the scale of that of the Raunds Area Project. Despite the scanty nature of some of the lines of evidence, the work has added an important body of new material. The studies have increased our understanding of both the nature of the impact of prehistoric peoples on their environment, and their exploitation of plant and animal resources.