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Environment and Land-use: The Economic Development of the Communities who Built Stonehenge (an Economy to Support the Stones)

MICHAEL J. ALLEN

THE STONEHENGE LANDSCAPE is one which has drawn the attention of antiquarians and archaeologists for centuries and, not surprisingly, this chalk landscape is one of the best studied archaeological landscapes in the country. With the exceptions of the Dorchester (Woodward 1991; Wainwright 1979; Allen 1994; Allen in Smith *et al.* 1997, 277–83) and Avebury areas (Smith 1965; Evans *et al.* 1993; Whittle 1991; 1993; Powell *et al.* 1996), it is a landscape which has received more detailed and structured palaeo-environmental enquiry by the mapping and recording of soils, analysis of land snails, faunal remains, charcoal, charred seeds and pollen, than almost any other (Table 1; but also see Allen 1994, table 52). This is the result of the interest aroused by Stonehenge as a monument, the surrounding landscape as an entity with other major sites such as Durrington Walls (Wainwright and Longworth 1971), Woodhenge (Evans and Wainwright 1979), and also to the recent large-scale English Heritage funded programmes published as the *Stonehenge Environs Project* (Richards 1990) and *Stonehenge in its landscape* (Cleal *et al.* 1995).

The strength and resolution of palaeo-environmental interpretation within any study area is largely based on the density of datasets. Unlike Evans's (1975) generalised interpretations which are based on just a few sites from which he was able to extrapolate general conclusions for all of southern England, recent work from several specific areas on the chalklands of southern England, of which the Stonehenge landscape is one, now enable palaeo-environmental interpretation of the landscape mosaic *within* these landscapes. As the resolution of interpretation relies, not on the number of datasets, but their density within the area of study, a simple calculation of this density enables a quasi-quantitative 'confidence' rating to be made (Table 2; Allen 1994, table 52) from which it can be seen that the Stonehenge landscape features highly. The density of datasets within each

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area is calculated and multiplied by 100 to give a relative information factor, or dataset content factor which gives some indication of the quantity of data behind the resolution of interpretation in each area and, therefore, some level of confidence we may place on the resolution of those interpretations (Table 2).

Despite this relative wealth of study, the detailed understanding of the 80 sq km area around Stonehenge, defined to the west and east by the Till and Avon valleys respectively (Fig. 1), is surprisingly weak and sparse when broken down into the newly defined chrono-

Table 1. Summary of the main elements of the palaeo-environmental database

MESOLITHIC		**8100–7100 cal BC**
monument types:	none	
artefacts:	scattered flint tools	
THE EVIDENCE		
At Stonehenge:		Post-pits in carpark
Environmental evidence:		
•	Avon Valley	pollen
•	Stonehenge carpark post-pits	pollen and snails
Archaeological finds:		
•	Few flints scattered across the area	
PRE-PHASE 1	**Early–Middle Neolithic**	**4000–3000 cal BC**
monument types:	Causewayed enclosures and long barrows	
artefacts:	Plain bowl pottery	
THE EVIDENCE		
At Stonehenge:		single cow-sized bone
Environmental evidence:		
•	Stonehenge buried soil	pollen and snails
•	Coneybury Anomaly	snails, charcoal, seeds and bones
•	Robin Hood's Ball pits	snails, charcoal and bones
•	Amesbury 42 long barrow	snails
•	King Barrow Ridge pits	snails, charcoal, seeds and bones
•	Durrington Walls OLS	pollen and snails
Other Archaeological sites:		
•	Long barrows	
•	at Robin Hood's Ball	pottery scatter
•	along King Barrow Ridge	pottery scatter
PHASE 1	**Middle Neolithic**	**2950–2900 cal BC**
monument types:	transitional, few monuments, Cursuses	
artefacts:	Peterborough Ware	
THE EVIDENCE		
At Stonehenge:		excavation of ditch and Aubrey Holes
Environmental evidence:		
•	Stonehenge	pollen, snails and bones
•	Greater and Lesser Cursus	snails and seeds
•	OLS at Durrington Walls	snails and bones
•	Coneybury pits	snails and bones
Other Archaeological sites:		
•	Durrington Walls settlement	
•	Robin Hood's Ball	pottery scatter
•	King Barrow Ridge/Coneybury	pottery scatter
•	Wilsford Down	pottery scatter
•	Stonehenge Down	pottery scatter

PHASE 2	**Late Neolithic**	**2900–2400 cal BC**
artefacts:	Grooved Ware	
monument types:	Henges	
THE EVIDENCE		
At Stonehenge:		construction of the timber settings
Environmental evidence:		
•	Stonehenge	pollen, snails and bones
•	Coneybury Henge	snails, charcoals, seeds and bones
•	Ratfyn	snails
•	Durrington Walls henge	bones and charcoal
Other Archaeological sites:		
•	Chalk Plaque Pit	
•	?Woodhenge	
•	east of King Barrow Ridge	pottery scatter
•	Stonehenge Down	pottery scatter
PHASE 3	**Late Neolithic–Early Bronze Age**	**1550–1600 cal BC**
artefacts:	Beaker pottery	
monument types:	Round barrows, palisade features	
THE EVIDENCE		
At Stonehenge:		construction of stone settings and Avenue
Environmental evidence:		
•	Stonehenge	pollen, snails and bones
•	many barrows	snails and soils
•	Upper fills Coneybury	snails, seeds and bones
Other Archaeological sites:		
•	Woodhenge	
•	Stonehenge Down	pottery scatters
•	Robin Hood's Ball	pottery scatters
•	Normanton	pottery scatters

logical phases of the construction of Stonehenge (Allen and Bayliss 1995). Nevertheless, by reviewing the data provided in both the *Stonehenge Environs Project*, hereafter called *SEP* (Allen *et al.* 1990; Carruthers 1990; Gale 1990; Maltby 1990), and the *Stonehenge in its landscape* volume (see especially Cleal and Allen 1995), the development of organisation and community farming that made possible the construction of the ever more complex monument of Stonehenge by prehistoric communities can be illustrated. In doing this, the inadequacies of the datasets can be realised and, more significantly, the inadequate chronological parameters of the palaeo-environmental information drawn from the landscape around Stonehenge recognised when compared with the high chronological resolution for the construction of the monument, as supplied by the recent large radiocarbon dating programme (Allen and Bayliss 1995).

This paper will, therefore, not address the question of *why* farmers of the Stonehenge communities felt they *needed* to build this edifice, as Bradley has (1993, 9 on), but of *how* those communities became *enabled* to build it. This paper has two objectives; first to show that some interpretation and answers of a more strictly cultural, or conventional,

Table 2. Comparison of the density of environmental datasets in chalkland archaeological landscapes and the calculation of a 'confidence factor'

	No. of datasets	Km^2 of chalk in study area	Density (datasets÷ Km^2)	Confidence Factor (density × 100)
Dorchester area	12	35	0.343	**34.3**
Stonehenge	17	54	0.315	**31.5**
Winchester area	3	16	0.187	**18.7**
Avebury	20	130	0.154	**15.4**
Isle of Wight	9	64	0.140	**14.1**
Strawberry Hill, Wilts	1	10	0.100	**10.0**
Lewes area, Sx	9	106	0.085	**8.5**
Kent	3	1500	0.002	**0.2**

archaeological nature can be provided through the archaeological enquiry of palaeo-environmental analyses which extends ideas outlined elsewhere (Cleal and Allen 1995, 484), and second, to suggest a framework for future structured palaeo-environmental enquiry within the area, while appreciating and highlighting weaknesses in the present datasets.

My contention is that in order to understand how communities survived and operated in the past it is necessary to examine more than just the obvious foci of attention; thus to understand Stonehenge we need to understand the communities and landscape surrounding the monument. This does not require the engendering of environmental determinism, but certainly the philosophy of environmental possibilism is embraced (i.e. that environments limit, but do not necessarily cause, patterns of human behaviour: Hardesty 1977, but see also Bell and Walker 1992, 8). It was, after all, the landscape around Stonehenge that contained the farmland which produced food to support both the local communities and the economic base which enabled these communities to provide the organisation and labour force to build, rebuild, modify and remodel the monument of Stonehenge. The interpretations derived from palaeo-environmental analyses enable us to examine and reconstruct the physical and economic arena within which prehistoric communities acted and interacted.

Bradley states that landscape history cannot be studied using an intellectual structure formed almost entirely around artefacts (Bradley 1978, 2) and here, by examining the evidence from the Stonehenge area, an attempt is made to show that it is possible to provide answers and explanation for purely 'cultural' activity via palaeo-environmental enquiry. Environmental archaeology is ideally suited to analysing the landscape; especially now that this discipline has progressed beyond being merely a technique for compiling floral, faunal and climatic sequences and has proved itself as a means to interpret past human activity (Evans 1975).

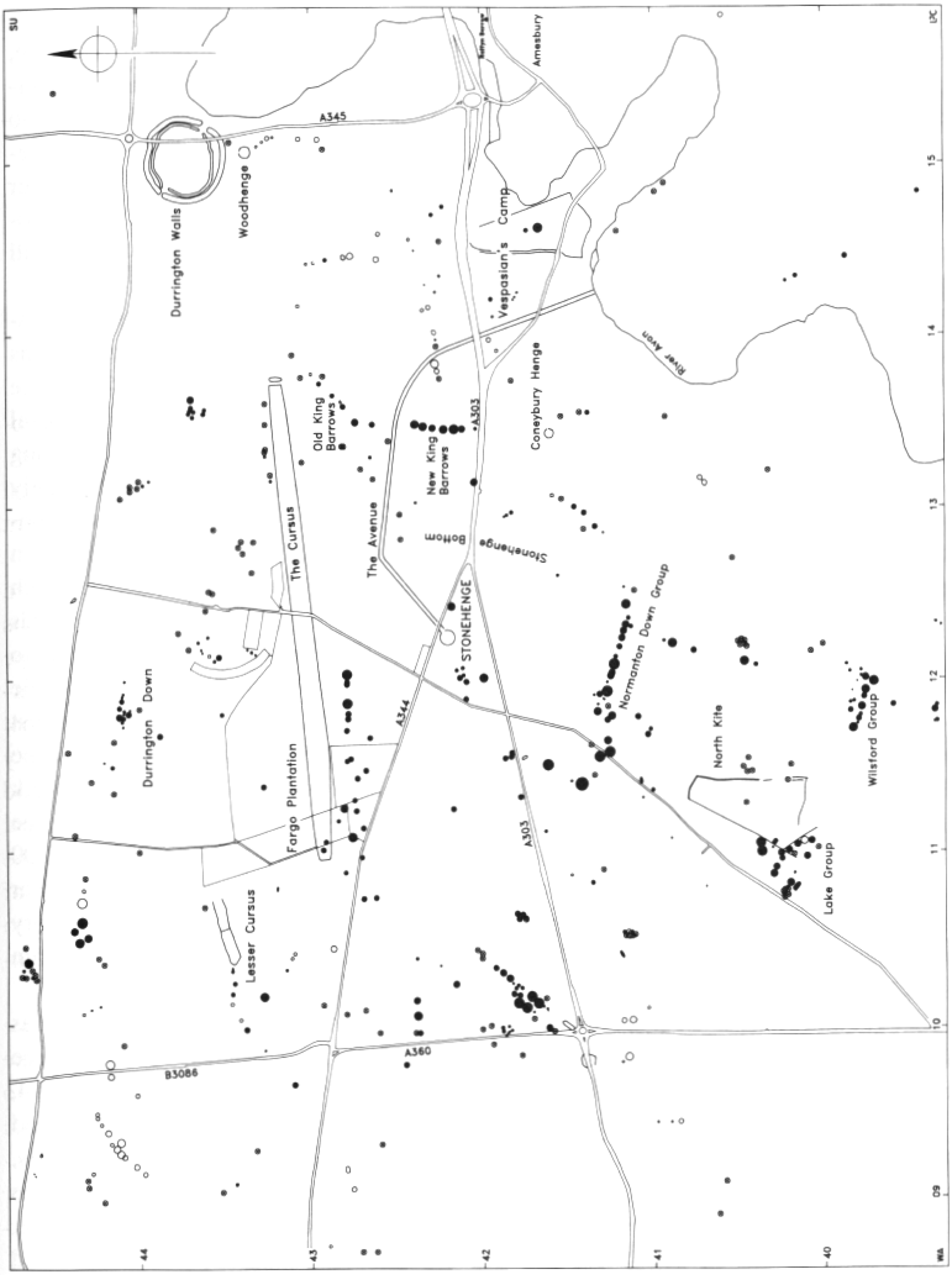

Figure 1. Location map of the Stonehenge Area as defined in *Stonehenge in its landscape* (after Cleal *et al.* 1995, fig. 21).

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The evidence

Most of the major environmental analyses have been undertaken recently and therefore, unlike some of the archaeological information from antiquarian sources, we can be confident in the identification and integrity of these datasets. It is still necessary, however, to interrogate the precise contexts from which some of these datasets originate. This is especially applicable to the faunal assemblages, which are often summarised by site rather than period (Richards 1990), and to the unquestioned acceptance and use of the radiocarbon determinations for the area which underpin the chronological framework for all interpretations of change and development.

Most of the palaeo-environmental information comes from archaeological excavations. With few exceptions, the assemblages of charred seeds, charcoal and faunal remains are small. Where faunal assemblages are larger (e.g. Coneybury 'Anomaly', Stonehenge Ditch), they are associated with single feasting events (Coneybury) or specific disposal (Stonehenge) and are not, therefore, representative of the usual farming and hunting economy. Nevertheless these environmental data (seeds, charcoal and bones) have usually been recovered from specific, dated contexts. In contrast, the evidence of the 'environmental landscape' and changing nature of the vegetation structure has largely been examined through the analysis of stratified sequences of land snails from ditches, such as at Stonehenge itself (Evans 1984) and Coneybury Henge (Bell and Jones, in Richards 1990, 154–8). Pollen sequences are especially rare on the chalkland, and a Boreal to Sub-boreal (Mesolithic–Neolithic) combined pollen and snail sequence from a Mesolithic post-pit at Stonehenge (Scaife 1995; Allen 1995) is therefore of prime importance, but enables the examination of only the environment of the earlier local prehistoric landscape nearly four millennia before any of the familiar monuments came into being. Recent work in the Avon floodplain has produced a long pollen sequence (Scaife forthcoming), the base dating from the seventh millennium BC (7950–7030 cal BC, GU-3239, 8460±200 BP). This does not record a complete vegetation record. Apart from the base, no other horizons or vegetation changes have been dated and thus the long vegetation history cannot be accurately correlated with monument building and archaeological events within the broader landscape with any acceptable degree of confidence.

A programme of broader non-site analysis of colluvial sequences (cf. Bell 1983) was unsuccessful because, surprisingly, it failed to identify such deposits in the Stonehenge landscape (Richards 1990, 210–11); an absence confirmed by recent augering (Allen 1994, 268–9, fig. 56). Such a lack of colluvium is anomalous in both Wessex (Allen 1992) and the chalklands of southern England (Bell 1983; Allen 1991). This lack of colluvial deposits, which are considered largely to be a result of human activity, is strange in view of the pre-eminent long history of activity in this area. This has puzzled, and continues to puzzle, a number of authors (Bell 1986; Richards 1990, 210–11; Allen 1991, 51–4; Cleal and Allen 1995, 484), but recent trenching on Coneybury Hill did expose shallow colluvial sequences, the new land snail analyses from which are presented here (Table 3).

Table 3. Land snail data from Coneybury Hill colluvial sequence (Tr 3100)

Sample	3130	3129	3121	3122	3123	3124	3125	3126	3127	3128
Context	3107	3106	3105	3104	3103	3103	3102	3102	3101	3101
Depth (cm)	spot	spot	75–90	62–75	52–62	46–52	36–46	24–36	12–24	0–12
Wt (g)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
MOLLUSCA										
Pomatias elegans (Müller)	–	–	+	–	–	+	1	–	–	–
Pupilla muscorum (Linnaeus)	–	–	–	1	1	2	1	1	–	–
Vallonia costata (Müller)	–	1	+	–	–	–	3	4	–	–
Vallonia excentrica Sterki	1	–	–	1	–	5	18	30	1	–
Limacidae	–	–	–	–	–	–	–	1	–	1
Cecilioides acicula (Müller)	13	7	–	19	23	63	56	31	7	3
Candidula intersecta (Poiret)	–	–	–	–	–	–	12	27	3	4
Candidula gigaxii (L. Pfeiffer)	–	–	–	–	–	–	1	1	2	2
Cernuella virgata (Da Costa)	–	–	–	–	–	–	3	–	6	2
Helicella itala (Linnaeus)	2+[2]	–	2	2	2	12+[1]	4	5	–	1
Taxa	2	1	1	3	2	3	8	7	4	5
TOTAL	3	1	2	4	3	19	43	69	12	10

The chronological limitations of the data

Palaeo-environmental data that provide evidence for *change* and *development* in a landscape are probably some of the most important. Such data can be gained from long pollen sequences (e.g. Avon Valley and Stonehenge carpark post-pits), snail sequences from ditches and other sediment traps (e.g. Stonehenge, Cursuses, and pits), or colluvial and alluvial deposits (e.g. Figheldean, Allen and Wyles 1993; and Coneybury Hill, see below).

It is, however, often difficult to integrate and relate the changing evidence provided by palaeo-environmental sequences from these ditches, pits, and colluvial and alluvial deposits with any specific episodes of monument building or other specific archaeological events. Cleal demonstrates this in her attempt to correlate the mollusc sequences from the Stonehenge and Coneybury ditches (Cleal *et al.* 1995, 163). Often, only the construction date is known for pits and ditches of monuments which merely relates to snail-poor sequences from the primary fills. This only provides the date of the *start* of a land-use history depicted in sequence which may, albeit possibly intermittently, extend over several millennia. In fact it is this very longevity that is the attraction of these sequences in examining land-use change and development.

The limitations of such weakly dated sequences immediately becomes apparent when attempting to correlate these interpretations with the tighter chronological resolution provided by recent programmes of ^{14}C results obtained from monumental sites in the area. Although these limitations cannot be immediately overcome, they can begin to be resolved in part by the careful examination of archive records of the occurrence of datable artefacts (mainly pottery) from ditch fills, in order to provide a tighter chronology for many of the sequences than have been recorded in previous publications. By combining evidence from these artefactual and ecofactual assemblages with the results of the radiocarbon programmes it is now possible to begin to obtain both spatial and chronological resolution across much of the Stonehenge landscape. For instance, by the examination of the distribution of diagnostic sherds in the upper fills of the Coneybury Henge, the important molluscan sequence can be related to the events in other sites and, *inter alia*, attempt to relate this environmental event more confidently with the other events in the area.

The writer is aware of the weaknesses in the chronological relationship between some of the palaeo-environmental sequences and undated monuments, on the one hand, and the tightly-dated sequence at Stonehenge (Allen and Bayliss 1995; Bayliss *et al.*, this volume) on the other. For each phase of construction at Stonehenge, the main sites and nature of the environmental evidence utilised in these discussions is summarised (Table 1), in order to enable both easy reference to the relatively large and diverse spectrum of data. It will also aid critical re-examination of this interpretation should further radiocarbon dates or other information contradict the phases into which environmental datasets and monuments have been placed (Table 1, Fig. 2).

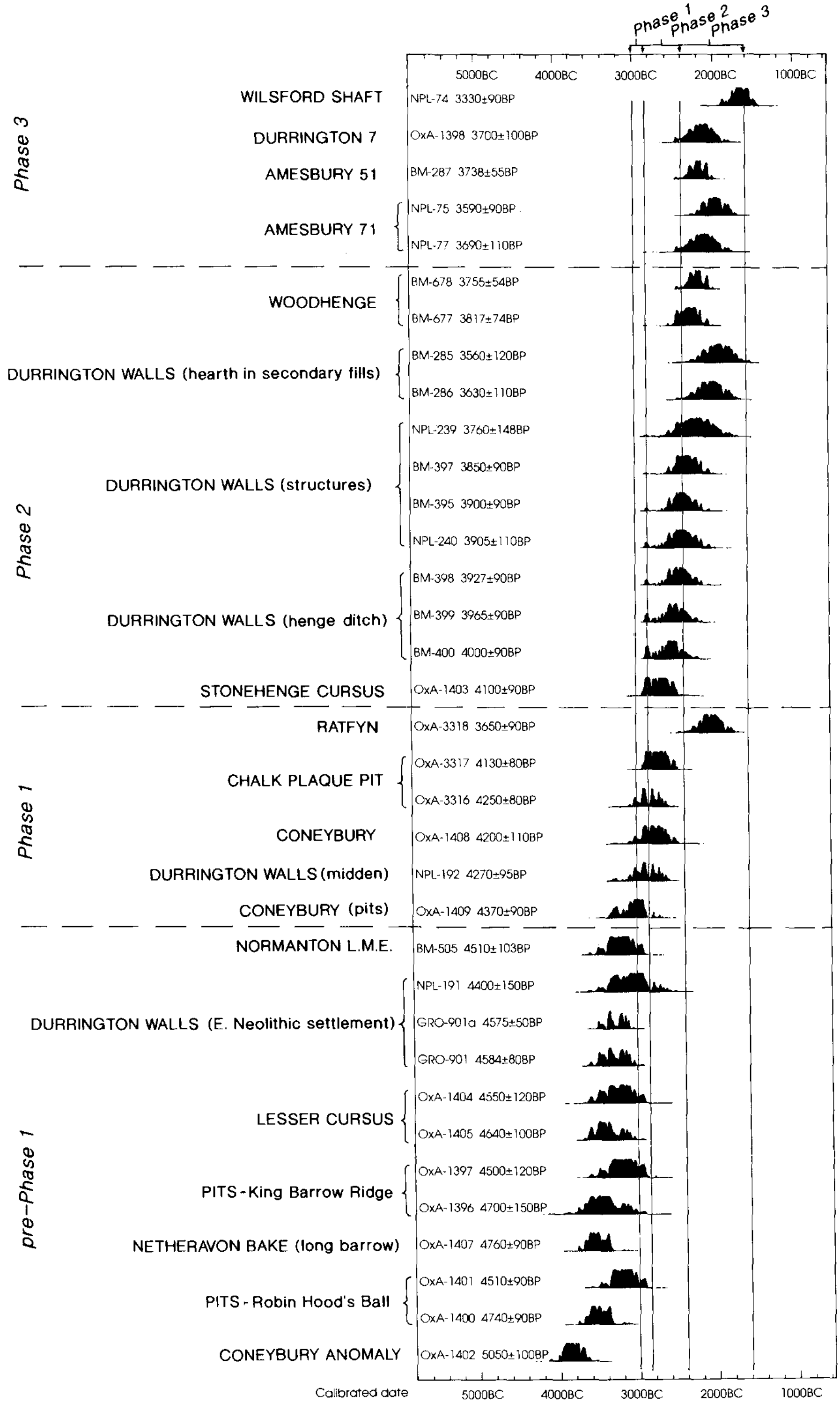

Figure 2. Radiocarbon dates and distributions for the main monuments in the Stonehenge area, divided chronologically by the developmental phases of Stonehenge itself.

The economics behind the building of Stonehenge

Many of the environmental data, and local interpretations of those data, are published elsewhere. Where they have been used in interpretations in this paper, they are referenced in tables by the phases defined for Stonehenge itself (Cleal *et al.* 1995) for convenience of cross-reference (Table 1). This paper, therefore, reviews much of the previously published evidence, but places it within the chronological framework provided by the new phasing of Stonehenge itself. A few new, additional, analyses are included, particularly where major monuments have previously failed to produce palaeo-environmental sequences, or where previous radiocarbon dates are open to question, as at, for instance, the Stonehenge Cursus.

By these means maps of the development and pattern of the utilisation of the landscape can be drawn (Plates 2–5). Unlike those presented in the Stonehenge Environs Project (Allen *et al.* 1990, fig. 155), which were academically strict in depicting interpretation only around the location where datasets occurred, in this paper the reconstructions attempt to be more holistic, and are not just based on specific datasets (viz. Allen *et al.* 1990, fig. 155), but also use evidence of local topography, artefact and monument distributions, as well as educated, informed postulation, to complete an impression of the entire Stonehenge landscape.

The construction of the Stonehenge monument that we see today required considerable community and collaborative effort. The development of the monument from a simple enclosure ditch to one containing a complex of timber settings was achieved over an extended period of *c.*500 years. Four and a half millennia prior to this, however, Mesolithic communities were erecting unusual 'monuments' in the same area (see below).

In its earliest phase (Phase 1; *c.*3000 cal BC), Stonehenge, as a simple causewayed or segmented enclosure ditch, is not unusual in the chalk landscape, as can be seen by the presence of other communal monuments such as the Earlier Neolithic enclosure at Robin Hood's Ball and contemporaneous monuments of the Lesser and Stonehenge Cursuses. Using Startin's calculations (1982) a labour force of about 45 strong could have constructed the causewayed ditch at Stonehenge in about 5 weeks (working a 50 hour week with *c.*7 hours of daylight).

In its second major phase (Phase 2; 2900–2400 cal BC), the ditch enclosed a complex of timber settings which are essentially undefined (Cleal *et al.* 1995). They may have been considerably more complex than a simple series of wooden, even embellished, posts (see Gibson 1994). Stonehenge was not unique even within its local area; the henge monuments at Durrington and Woodhenge in the Avon valley and that at Coneybury were all built with timber structures. Furthermore the construction at Stonehenge, apart from the erection of timber posts, need not have required a large work-force for an extended period of time.

It is only in its final and most prolonged phase (Phase 3; 2550–1400 cal BC), that the stone monument is unique. The construction of the stone monument required a much larger work-force over an extended period to complete even individual elements of this setting; far more than in earlier phases the construction required transport, retrieval, planning, management and engineering skills (see Richards and Whitby, this volume). It is the extent and scope of this design and the management of it that is unique and which is emphasised by the recent rephasing and radiocarbon programme which show the continued development, modification and re-modelling of the stone settings over a period of more than one millennium.

In this last phase the construction of, for example, the sarsen settings (phases 3ii and 3iii) would require a minimum work-force of 600 over 58 weeks, again based on figures given by Startin and Bradley (1981) and estimated on the basis of a 50 hour week. This makes many assumptions: that Startin and Bradley's calculations are broadly correct (they differ significantly from Renfrew 1973), that sarsen settings were constructed as a single event, and that the work-force was deployed continually to a single plan for over a year. It does not take into account any other external, climatic, social or political factors. This, however, need not worry us, as the main points are to demonstrate first, that this stage of the monument required manpower on a significantly different scale than in earlier phases (both Startin and Bradley's, and Renfrew's calculations demonstrate this) and that this required the deployment of an extensive work-force operating over, in terms of the farming year if nothing else, a large time period, and secondly, the continued necessity of the local community, or communities, having the organisational framework (cf. Renfrew 1973) and a sufficiently sound economic basis to allow them, as required, to provide shelter and provision for a large and economically non-productive work-force.

The details of analysis and previous interpretations are adequately presented elsewhere (*SEP* and *Stonehenge in its landscape*, Cleal *et al.* 1995). What follows is a summary of the development of the landscape and economic base of the area in relation to the phases of construction and building of Stonehenge defined by Cleal *et al.* (1995), in order to highlight the main points. Limited new analyses and data are presented where appropriate.

Mesolithic; human activity in a wildwood landscape, 8100–7100 cal BC (Plate 1)

It may seem strange to begin by briefly discussing the nature of the vegetation structure and the environment around Stonehenge at a time some four millennia before even the first dated evidence at the Monument itself. Nevertheless the presence of people at this time indicates the longevity of use of the area, and may provide us with some possible reasons why this location was later chosen for the construction of the Monument.

The downland, supporting thick brown earths or argillic brown earths, was covered with open hazel and pine woodland (Allen 1995; Scaife 1995). Within a cleared area of this at least four pine posts, cut from the local woodland, were erected upright in deep post-pits in the eighth millennium BC (Plate 1). Parallels for these upright posts can be drawn from herding facades, or even totemic poles, both of which are used by North American hunter-gatherer communities existing in a 'Boreal-type' environment. Care must be taken not to over-speculate, but if the poles do represent a formal display such as a series of 'totem' or symbolic ceremonial posts, then it is of interest to note that where such items occur in native American civilisations, they are erected as a mark of respect for past chiefs and that their locations form arenas of ritual and dance, rather than a focus for settlement and domestic activities. Dancing would leave little obvious trace in the archaeological record. A number of radiocarbon dates belonging to the eighth millennium BC, and the character of the vegetation, independently suggest that these features must belong to this period, despite the fact that no Mesolithic artefacts were associated with any of the excavations (Vatcher and Vatcher 1973; Allen 1995), or within the vicinity (Wymer 1977).

It is not known how widespread was the clearance of the pine and hazel woodland in the area of Stonehenge, and pine charcoals were even recovered from unstratified layers within the Monument itself (Gale, in Cleal *et al.* 1995, 461). Nevertheless, it is possible to suggest that this activity instigated an irreversible change in the local vegetation history. Vegetation composition was not static, but gradually changed in response to wider climatic development. The local regeneration and vegetation succession to woodlands of Sub-boreal climes may have rendered permanent differences in the areas which had already been cleared. If so, it is possible that this area supported a modified vegetation, slightly different from that in the immediate surrounding area even as much as four millennia later. This may, therefore, have played a part in the choice of the location of Stonehenge as it is possible that a vegetation of less dense, open woodland, or even grassland, might have been an attractive location. It may also have provided evidence of the presence of the forefathers, and meaning to antecedents at this location. We can only speculate.

Pre-Phase 1: Early to Middle Neolithic; taming the wildwood, 4000–3000 cal BC (Plate 2)

Despite the evidence for a Mesolithic presence at the site of Stonehenge itself, this place was not a centre of activity in the Early to Middle Neolithic. There is no evidence of the large-scale plain bowl pottery scatters, or an early causewayed enclosure, as seen at Robin Hood's Ball (Cleal *et al.* 1995, fig. 252), nor even of occasional finds of plain bowl or the siting of a long barrow.

There is, however, evidence of activity over most of the area (Plate 2; Cleal *et al.* 1995, fig. 252), from which a number of radiocarbon dates have been obtained (Fig. 2). Within this period we can see the construction of the Robin Hood's Ball causewayed enclosure and the erection of numerous long barrows, for which a date of 3780–3640 cal BC (OxA-1407, 4760±90 BP) has been obtained from Netheravon Bake. A large scatter of plain bowl wares centres on the enclosure and on a group of dated Neolithic pits at Robin Hood's Ball (Table 1, Plate 2). Other pottery finds occur on Coneybury Hill and King Barrow Ridge.

Despite the lack of artefactual activity at Stonehenge itself, the shallow buried soil beneath the bank contained pollen which indicates an open grassland environment, at least in the locality of the site (Scaife in Allen 1995, 61). Snails from a thin 'poorly differentiated' layer, also under the bank and 'lacking clear horizons' (Evans 1984, 7), certainly corroborate this (Evans, op. cit., zones A and B). Recent augering confirmed the presence of a buried thin rendzina soil (Allen 1995, 60–1).

Much of the environmental evidence, particularly land snails (e.g. Netheravon Bake, Amesbury 42 etc.), indicates open grazed grassland, but the strong bias in the database must be borne in mind. Samples have been consistently taken from archaeological sites, and therefore are biased towards areas of *known disturbance* and human modification of the natural vegetation. Without hillwash or pollen sequences which can be confidently related to this period, there is little else upon which to rely. Charcoals, however, indicate woods of elm, ash, oak, hazel and yew, and limited faunal remains suggest the herding of cattle and possibly some sheep, management of pigs and hunting of deer and aurochs in the woodland and of beaver and fish in the rivers.

The environmental evidence may be biased towards open grazed grassland, but it cannot be denied that large tracts, though by no means all, of the Stonehenge landscape were clear-felled. Much of the chalkland, and presumably the river valleys, however, would still have been considered as 'wildscape'. The character of the woodland, which we assume to have been relatively widespread, changed as areas were locally clear-felled and subsequently allowed to regenerate. This resulted in a complex mosaic of vegetation types with areas of ancient denser woodland, light open mixed hazel and oak woodland and clear-felled areas of shrubs and grassland for grazing, browse, cultivation and occupation.

Overall this evidence seems, irrefutably, to indicate clearance with browse and graze for cattle, sheep and deer. The few cereal remains recovered indicate that crops were cultivated, but probably in small plots, while feasting events (e.g. Coneybury 'Anomaly'), situated in small woodland clearings, were more concerned with meat consumption.

This biodiversity of vegetation types allowed great diversity in the economy of the local population; limited farming would have encouraged more permanent foci of activity; the woodlands enabled pannage as well as hunting and cultivation and collection of plants (see Moffett *et al.* 1989). The mosaic of vegetation types this created was not static; it changed continually through natural regeneration and succession, and through localised human exploitation. Although the overall pattern generally remained constant, the detail of any specific area may not have. Continued small-scale activities of not wholly sedentary populations contributed to this increasing local biodiversity.

Phase 1: Middle Neolithic; the siting of the monument in its landscape, 2950–2900 cal BC (Plate 3)

The site chosen for the Monument may have been influenced by a number of factors including immediate antecedent activity or long-past activity, as suggested above. It is also possible, as discussed above, that previous human activities may have manifested themselves in permanent and obvious changes in the vegetation pattern resulting in a different local ecological regime with its own floral and faunal characteristics. This would mark an area as different from its surroundings, and may have made the site immediately, or superficially, more attractive; particularly if it was realised this difference was due to the actions of previous communities—the ancestors. Many monuments were constructed in places that had already acquired special significance (Bradley 1991; 1993, 45)—perhaps the Mesolithic presence and placing of upright pine poles at Stonehenge was a part of that earlier, special significance.

The landscape

Although in radiocarbon terms it is now possible to tie the digging of the Stonehenge Ditch to a very tight period of about 50 years at the beginning of the third millennium BC (Bayliss *et al.*, this volume), in order to understand contemporaneous environmental data it is necessary to consider a broader date range of 3500–3000 BC. Otherwise there would be no dated, strictly contemporaneous, information to consider.

Much of the environmental evidence (snails) again indicates open grazed grassland, but the same inherent biases exist in our datasets. At Stonehenge itself Evans's detailed analysis indicates an established grazed downland in his zone A from the base of the Stonehenge Ditch, and beneath the bank (Evans 1984). Buried soils from the later monuments of Durrington Walls (Evans, in Wainwright and Longworth 1971) and Woodhenge (Evans and Jones 1979) also probably refer to this period, and these too indicate an established grazed downland.

The Lesser Cursus can be considered to be broadly contemporary with this phase in terms of its general architectural form (Gibson 1994), pottery (Raymond in Richards 1990, 82–3), and radiocarbon dates (Fig. 2). Multiple molluscan analyses by Entwistle (in Richards 1990, 88–93) produced only sparse Neolithic assemblages from basal deposits (see Entwistle in Richards 1990, tables 37–42 presented in microfiche 1, D5–10). Most of the molluscan sequences, although they depict some spatial variation along the length of this monument (op. cit., 93), refer to undated ditch silting episodes, possibly in the Late Neolithic but, more likely, in the Bronze Age.

The Stonehenge Cursus, which is closer to the Monument, has neither satisfactory radiocarbon dates nor anything in the way of environmental evidence. The radiocarbon date on an antler recorded from the base of the ditch by J.F.S Stone (1947), of 2910–2460 cal BC (OxA-1403, 4100±90 BP see Fig. 2) is considered erroneous as Richards indicates that the antler may have come from an intrusive feature (Richards 1990, 96) and the date does not make sense in terms of the monument's relation with other sites in this area (Cleal and Allen 1995). This cursus is generally considered to be contemporary with the Lesser Cursus, and certainly not significantly later as suggested by the radiocarbon evidence. Although columns of samples were taken for molluscan analysis, the decalcified nature of the deposits in a section through Fargo Wood and the low numbers in a second section at the Larkhill track (Richards 1990, 93, 95, tables 45 and 46 presented in fiche 1, D14 and E1) precluded meaningful interpretation. In an attempt to rectify this a ditch section, fortuitously exposed by a tree fall during the same event that damaged many of the barrows in the King Barrow Ridge making sections there available for examination (Cleal and Allen 1994), was recorded and sampled (Fig. 3).

The basal molluscan assemblages, although low in shell numbers (Table 4), indicate that the construction and early ditch silting history of the Cursus occurred in an established open grazed environment. Possible hints of local cultivation can be seen in the base of the secondary fills (Fig. 3), from which charred caryopses of *Triticum dicoccum* (emmer) were recovered from the mollusc samples (ident. J. Ede).

This general picture is therefore clearly biased towards clear-felled and grazed downland. Nevertheless it is evident that this landscape was a rich and diverse mosaic of habitats (Plate 3). The few charcoal records include oak, hazel, *Prunus*, Pomoideae and maple (Gale 1990, 252–3), indicating some open, probably secondary, woodland.

Many of the clearings seen in the Earlier Neolithic had become both larger and more permanent, with established grazed grassland (Plate 3), especially along the King Barrow Ridge (snails beneath the barrows) and banks of Durrington Walls, Woodhenge and Stonehenge itself. The close cropped nature of the vegetation structure indicated by the snails suggests that the grassland was under relatively rigorous grazing, probably by cattle and sheep, but also possibly deer. This is confirmed by the sparse bone evidence which also included aurochs (Lesser Cursus) and pig.

We can also speculate that within these open areas some arable cultivation occurred in plots of land, as charred grains of *Triticum dicoccum/spelta* (emmer/spelt) and indeterminate cereals have been recovered from Robin Hood's Ball, King Barrow Ridge, Coneybury Hill and the Stonehenge Cursus.

Phase 2: Late Neolithic; landscape change or continuity?, 2900–2400 cal BC (Plate 4)

Environmental evidence for phase 2 is largely limited to the two long and important snail sequences from the ditches of the Coneybury Henge (Bell and Jones 1990) and Stonehenge (Evans 1984), and can be augmented by information from beneath the banks of Durrington Walls and Woodhenge. With less confidence it may also be possible to ascribe the mollusc sequence analysed from the secondary ditch fills of earlier monuments (e.g. Lesser and Stonehenge Cursuses) to this phase.

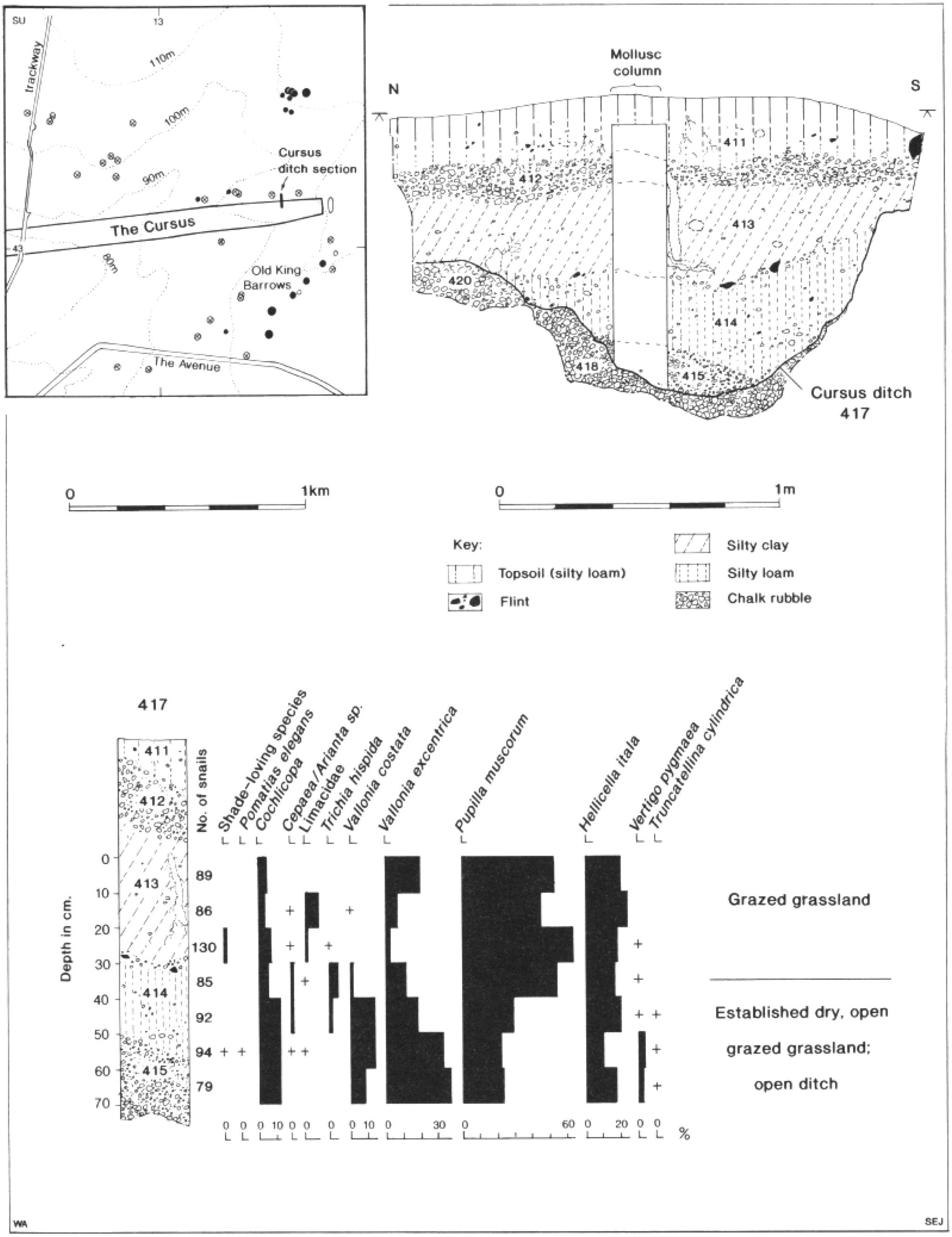

Figure 3. Stonehenge Cursus, sampled ditch section, and mollusc histogram.

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Table 4. Land snail data from the Stonehenge Cursus

Feature	Stonehenge Cursus [417]									Stonehenge Cursus [409]						
Sample	2025	2026	2027	2028	2029	2030	2031	2032	2033	2035	2036	2037	2038	2039	2040	2041
Context	418	419	421	421	421	421	421	421	422	415	415	414	414	413	413	413
Depth (cm)	spot	spot	55–65	45–55	35–45	25–35	15–25	10–15	0–10	60–70	50–60	40–50	30–40	20–30	10–20	0–10
Wt (g)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
MOLLUSCA																
Pomatias elegans (Müller)	–	–	+	–	–	1	–	–	–	+	1	–	–	2	–	–
Cochlicopa lubrica (Müller)	–	–	–	–	–	–	–	–	–	3	2	3	–	–	–	–
Cochlicopa spp.	–	+	–	–	–	–	–	–	–	6	9	8	5	9	3	4
Truncatellina cylindrica (Férussac)	–	–	–	–	–	–	–	–	–	1	1	1	–	–	–	–
Vertigo pygmaea (Draparnaud)	–	–	+	–	–	–	–	2	5	2	4	1	1	2	–	–
Pupilla muscorum (Linnaeus)	2	12	3	4	3	10	16	16	17	18	21	27	46	82	37	46
Vallonia costata (Müller)	2	7	1	–	–	–	–	–	–	7	13	13	2	–	1	–
Vallonia excentrica Sterki	1	5	2	–	1	3	14	21	14	29	31	17	10	4	12	18
Ena obscura (Müller)	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–
Punctum pygmaeum (Draparnaud)	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–
Vitrina pellucida (Müller)	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Oxychilus cellarius (Müller)	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–
Limacidae	–	–	–	–	1	1	1	1	–	–	1	–	1	3	8	–
Euconulus fulvus (Müller)	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cecilioides acicula (Müller)	–	–	–	–	–	3	1	–	1	–	–	–	–	–	–	–
Clausilia bidentata (Ström)	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
Candidula intersecta (Poiret)	–	–	–	–	–	–	1	2	2	–	–	–	–	–	1	2
Candidula gigaxii (L. Pfeiffer)	–	–	–	–	–	–	–	1	1	–	–	–	–	–	1	1
Cernuella virgata (Da Costa)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	2
Helicella itala (Linnaeus)	1	5	1	2	3	5	6	10	2	13	9	18	14	23	21	16
Helicellids	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–
Trichia hispida (Linnaeus)	–	–	–	1	–	–	–	–	1	–	–	2	4	1	–	–
Cepaea/Arianta spp.	–	–	–	–	–	–	–	–	–	–	1	2	2	1	1	–
Taxa	5	5	4	3	4	5	5	7	8	7	11	9	9	11	10	7
TOTAL	7	30	7	7	8	20	38	53	46	79	94	92	85	130	86	89

Coneybury was constructed in a recently cleared opening in the woodland, which was probably contemporary with Evans's zones C and D from the secondary fills of the Stonehenge Ditch. John Evans suggested that these indicate regeneration of a woodland or scrub cover; however, although the molluscan analysis is not questioned, the nature of the analysed deposits have been (Cleal *et al.* 1995, 163). Caution should therefore be expressed in interpreting this as an abandonment phase. Nevertheless, at Durrington Walls and Woodhenge the evidence is less ambiguous; an open countryside is evidenced in the mollusc data by the presence of the monuments themselves, and the large Grooved Ware pottery scatters (Plate 4; Cleal and Allen 1995, fig. 254). The secondary fills of both Cursus monuments (if they can be related to this phase) suggest open grazed downland but also arable activity. In contrast, Kennard lists a mixed snail assemblage from the Grooved Ware pit at Ratfyn, probably suggesting ungrazed grassland and localised scrubby vegetation (Kennard 1935).

Economic evidence is limited, but deer and pig are present in the assemblages from King Barrow Ridge (Maltby in Richards 1990), and cattle and sheep/goat were present as well as deer and pig in the Chalk Plaque Pit (Maltby in Harding 1988). The large assemblage from Durrington Walls confirms the presence of these species and indicates the keeping of relatively large herds of cattle (Harcourt in Wainwright and Longworth 1971) which can utilise both browse and graze.

There is, therefore, unfortunately, comparatively little evidence of land-use and economy of the Stonehenge area in the second half of the fourth millennium BC and it is difficult to map the *development* which occurs during phase 2 in any detail (Cleal and Allen 1995, 481). What evidence there is, tends to indicate an expansion of the utilised and farmed area in which more emphasis may have been placed upon cereal cultivation. Nevertheless, both grazed downland and woodland for pannage and its animal and floral resources were important elements in the economy.

Phase 3: Late Neolithic–Early Bronze Age; the Beaker Period; an economy to support the stones, 2550–1600 cal BC (Plate 5)

During the millennium of the time of the stone settings (phase 3), there is a wealth of archaeological evidence from the Stonehenge area. One only has to glance at the distribution maps of the archaeology (see Cleal *et al.* 1995, fig. 255; Richards 1990, fig. 159) to recognise this. The environmental data are also more extensive.

Evidence

The barrows in the cemetery along King Barrow Ridge and at Amesbury were constructed in well-established short-grazed downland. Those on King Barrow Ridge were actually constructed of turves cut from a large area of downland (Allen and Wyles 1994).

Stonehenge was also in pasture; evidence from the upper fills of the Ditch (Evans 1984, zone F) and Mesolithic post-pits (local mollusc zone 3) in the carpark (Allen 1995) confirm this. A more restricted range of species is represented in the charcoals (Gale 1990, table 136) and includes oak, hazel, Pomoideae and *Prunus* suggesting that where woodland survived it was, in the main, more open secondary and scrubby woodland. At this time too, the presence of cereal remains increases and most of the charred cereals from Coneybury come from the later fills which we can probably ascribe to this phase by virtue of the distribution of Beaker pottery in them (Ellison in Richards 1990, 146–8; Cleal *et al.* 1995, 163 and archive). At this site, it must be admitted that renewed activity, as indicated by the pottery in the upper fills of the ditch, the evidence of meat consumption (bones) and high numbers of cereal remains, seems somewhat incongruous in view of Bell and Jones's emphatic evidence of woodland regeneration and the description of the fills as colluvial which is probably contemporaneous with this feasting. Again, there are the same obvious difficulties in reconciling these two apparently conflicting sets of evidence as Cleal had in interpreting the evidence from the Stonehenge Ditch. Hints of a similar history can be seen from the ditch fills of the Amesbury 42 long barrow (Entwistle in Richards 1990, 105–9), but in the Beaker period the disturbance here may be a result of either the clearance of this vegetation or cultivation in the vicinity.

Molluscan evidence indicates that apart from Coneybury Hill, many other areas were not only in open downland (e.g. Stonehenge Ditch and upper fills of Mesolithic post-pits) but that they were in areas under cultivation. Evidence comes from beneath the Amesbury 71 barrow (Kerney in Christie 1964), from which there is also physical evidence of pre-barrow ploughing or rip-arding in the form of parallel scores in the chalk (Christie 1967, 347). The North Kite, in particular, although established in a pastoral landscape, probably existed in a mixed arable and pastoral one (Allen in Richards 1990, 191–2). Further evidence for tillage comes from the colluvial fills described in the upper fills of many ditches, and their included molluscs; sites include both Cursus monuments and the Durrington 3 barrow (Allen *et al.* n.d.).

Colluvium itself is somewhat enigmatic in its distribution. Investigations in valley locations at the Winterbourne Stoke Cross Roads (W17),[1] The Diamond on Wilsford Down (W18), Durrington Down (W19), two locations in Stonehenge Bottom (W20 and W22), a side valley of Stonehenge Bottom (W21), the Cursus Valley (W22) and 'The Deep Hole' at Greenland Farm (W26) all failed to identify colluvium which could be sampled by excavation and exposed for mollusc analyses (cf. Bell 1983). I have suggested that this lack of colluvium in many valleys may be due to either the intensive arable use of this landscape resulting in the flushing out of deposits (Allen 1991), or the continuous presence of grassland in some areas preventing its formation in the first place (Cleal and Allen 1995, 484). Although colluvium, which is a prime indicator of deforestation or cultivation (Bell 1983; Allen 1992), is not present in many of the valleys in the Stonehenge

1. 'W' numbers are the site codes referenced in *Stonehenge Environs Project* (Richards 1990).

area, there are deep deposits of this period at Figheldean (Allen and Wyles 1993) and at Durrington Walls. At the latter we can be sure that some must belong to this period as it post-dates the timber structures, and some pre-date the Iron Age settlement which extends from the Packway (where the Iron Age chalk-cut ditches are 2.1 m deep) into Durrington Walls itself, north of the northern circle, where the ditches are cut *through* colluvium and only occur as 0.3 m deep cuts in the chalk (Wainwright and Longworth 1971, 309–15). Nearer Stonehenge, colluvium also occurs in a small dry valley on Coneybury Hill, precisely in an area of known occupation and suspected arable activity at this time.

Colluvial sequence at Coneybury Hill

During evaluation work on Coneybury Hill a shallow (0.75 m) colluvial brown earth sequence was recorded at the top of a minor tributary of the Stonehenge Bottom dry valley, immediately south of the New King Barrows and about 450 m north of the Coneybury Henge (Wessex Archaeology 1993). Augering provided a profile of the valley sequence (Fig. 4) and, although not a great depth of colluvium, it is significant in view of the lack of such deposits recorded elsewhere within the Stonehenge area and especially as this tributary leads into Stonehenge Bottom above a point investigated by Bell (Richards 1990, 210–11). Beneath the stone-free, weakly calcareous colluvium was a deposit highly reminiscent of a relict ancient soil, probably a calcareous brown earth. Whether this is an *in situ* old land surface, or an earlier phase of erosion is not certain. However, it is possible that it represented a horizon of possible Neolithic date and may be contemporary with evidence for Grooved Ware activity discovered in the immediate area as a result of the same evaluation exercise. The stone-free and non-calcareous nature of the colluvium overlying this 'soil' would normally be taken to indicate the erosion of earlier soils (i.e. Neolithic/Bronze Age—cf. Allen 1992). However, the presence of later prehistoric (Iron Age) pottery in the lowest colluvial horizons indicates the stripping of all former soils from this minor valley at least by this time. The presence of former deeper, weakly calcareous soils can be considered relatively unusual this late in prehistory (cf. Allen, op. cit.), but local parallels can be found in the colluvial sequences recorded both within, and on the footslopes of, Vespasian's Camp (Allen 1994; Allen in Hunter-Mann forthcoming).

The Mollusca from the Coneybury Hill colluvium (above) (Table 3) are typical in that they indicate tillage. That from the buried soil suggests pasture. There is no evidence for the woodland elements seen in Bell and Jones's assemblages from Coneybury Henge itself.

Cultivated fields

The evidence discussed above can be seen as an indication of arable activity alongside the herding of sheep and cattle. Cultivation occurred on plots of land large enough to

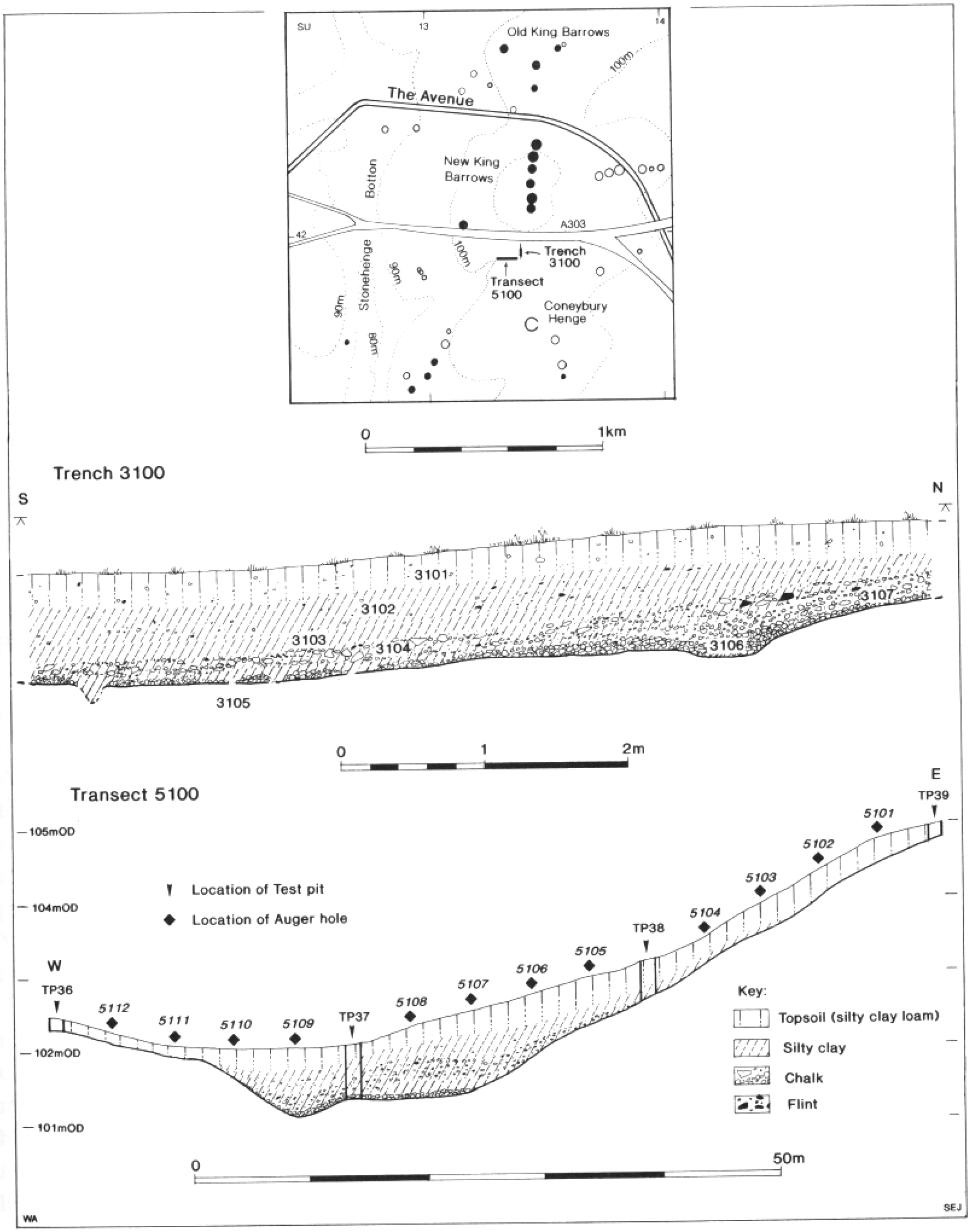

Figure 4. Section of Coneybury Hill colluvial sequence.

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cause soil erosion on a reasonable, but highly local, scale. The fact that some areas of the landscape have been partitioned off (North Kite) may also suggest demarcation or protection of larger arable areas from herded animals.

In the post-monument phase (i.e. Middle and Later Bronze Age) large areas of field systems existed (see Cleal *et al.* 1995, fig. 187; Richards 1990, fig. 160) and are still evident as lynchets. For them to be present at this time suggests soil erosion, and thus cultivation, of most of these areas in previous periods, and enables it to be suggested that many may have been cultivated during Stonehenge phase 3. The apparent lack of a formalised field system, however, may be a combination of both the lack of a necessity to delineate large tracts of land, as seen in the Later Bronze Age (e.g. linear ditches, Bradley *et al.* 1994), and the fact that any formal field systems had not yet acquired established physical boundaries in the form of lynchets.

This evidence, together with that of pottery scatters which are probably some of the most extensive in southern England (see Plate 5) suggests both that farming populations were well-established locally and also, although we have no physical excavated evidence, were *living* locally.

During Stonehenge phase 3 we have no evidence of the nature of houses or buildings, and to a large extent we do not know what we are looking for even if it survives. The fact that the soils may have been considerably thicker (postulated to be about 1 m thick in the Mesolithic) enables us to suggest that post-holes for timbers may hardly have needed to penetrate the chalk. This, coupled with the known physical loss of the Chalk, calculated by Drewett (1977, 205) as being up to 0.8 m, suggests that little is likely to survive. The extensive flint and, more specifically, Beaker and Early Bronze Age pottery scatters are our most tangible evidence for large areas of domestic settlement. With the exception of Robin Hood's Ball, these all cluster around Stonehenge on Stonehenge Down, Durrington Down and Normanton Down.

Discussion: farmers and the development and use of farming

Ritual and community

It should be evident that this argument takes as its basis the assumption that communities operating within the Stonehenge environs had the power, 'finance' and economic wealth with which to employ a work-force to construct the magnificent edifice that today lies in ruins on Salisbury Plain. I believe, as do Gardiner and Cleal (forthcoming), that this landscape should not be viewed as a 'ritual landscape', if indeed such exists (see Cooney and Gardiner forthcoming), that is, a landscape largely concerned with exclusion and non-domestic activity. Undoubtedly, ritual and 'religious' activities and rites played an important role in the area, and some elements of communities had the political power and control to manage the construction of major edifices of stone and timber and chalk, but they are only one element in a diverse social landscape, which provides rich, if not as physically obvious, evidence for the utilitarian, everyday activities of the communities living within it.

It is through the consideration of the environmental evidence and interpretation of the development of the human impact on this specific landscape, that we can address the question of the *economic* basis upon which Stonehenge was built.

Farming communities, not just farmers

It has been suggested above that, during phase 3, there is a definite shift from a landscape dominated by grazing to one of mixed arable and pasture and a greater emphasis on the cultivation of cereals than in previous phases. Critically, however, the balance of arable and pasture is unresolved. Nevertheless, this trend towards an economy more reliant on farming, with both permanent pasture and cultivation, and thus sedentism, is demonstrable by the time of the inception of phase 3. Any immediate-return system (i.e. hunting, foraging and farming) requires the potential for mobility and contrasts with delayed-return systems (Woodburn 1982), which by virtue of their more specialised economy, lead to less mobility and enable or require social institutions leading to rank and status in a stratified society with centralisation, as argued by Whittle (1981). We can see the full development of farming communities from a more diverse hunter, gatherer, collector, forager economy, labelled by Hayden as 'accumulators' (1990), which also included farming, at the time of the stone settings. By this time, we can see a point in which the communities were using some cereals as an integral, but not major, part of their economy. Where previously, the loss of a cereal crop by crop failure or other factors would not be important, in the Early Bronze Age once its cultivation had become a specialism and was an integral part of the economy, the loss of an annual yield would have been more profound. This increasingly heavier reliance on cereals contributes to the increased permanency of settlement and increased residence time in the area, but when undertaken through tribal or chiefdom societies provides the assurance of community safeguards and gives importance to place and time. Meillassoux contends that farming therefore instils a sense of the past, while at the same time necessitating judicious planning for the future (1972; 1981).

With this, too, came increasing sedentism (Allen in Cleal *et al.* 1995, 169) which is represented by the large foci of pottery scatters. This mixed farming economy and cereal cultivation required community management and the investment of labour with delayed returns, concomitant with labour-intensive episodes of ground preparation, sowing and harvesting. With a delayed return on labour expenditure and the necessity for storage facilities, this economy not only provided a mechanism for an organised, and potentially hierarchical or stratified society, but also enabled the deployment of relatively large numbers of the community during agricultural non-intensive or slack times of the year. It also allowed the possibility, through management and control, of producing a surplus with which to enable the provision of the non-economically productive group of the community who, instead of being engaged in agricultural practices, could be directed towards the building of large-scale, economically extravagant, communal monuments. Thus physical wealth, reflected in the presence of portable objects in some of the contemporaneous barrows, together with the availability of, possibly seasonal, labour, may be contributing factors to, and might be formally displayed by, the construction of the monument itself.

It is perhaps no surprise, therefore, that it is when we can see the formation of an economy that might enable the community to have social order/hierarchy, and the potential to both empower and deploy a work-force, that we see the beginning of the stone construction at Stonehenge. This is not invoking environmental determinism, but surely is a prime example of environmental possibilism.

The argument is not, therefore, that more intensive exploitation, specialisation and agricultural tasks *require* a significant work-force, but that such sedentary communities are more prone to have both a larger population, through their more sedentary lifestyle making procreation and child rearing easier, *and* they have the potential to sustain that increased population.

These ideas are not new, for Renfrew presented them over 20 years ago (1973) and they have been current in much of the archaeological literature since (e.g. Whittle 1981; Bradley 1991; 1993; Sherratt 1990, etc.). However, the environmental database at Stonehenge now provides evidence and argument for the pattern of development of that economic base; i.e. the economic mechanism to enable a stratified society to build a monument of this scale.

Proposals for the future

It is evident from this review of the development of social farming through the phases that, despite this being one of the most intensively studied archaeological landscapes in the United Kingdom, our environmental database is frighteningly small. There are very few good domestic assemblages of bones that are not biased by placed items or single event (feasting) deposits, and few charred cereals and charcoals with which to examine the detail of interpretation we now wish to attempt for this area. In this respect the Danebury project, located only some 30 km distant, and dealing with a period one millennium later, is a fine example of where just such assemblages of plants and bones are being acquired. The resolution of our understanding of the changing land-use is relatively poor, in particular with respect to the balance of arable and pasture with the economies of any phase. Any interpretation presented is necessarily weakened because of this, and thus isolating this balance must be one of the priorities in analysis and information collection from further fieldwork programmes.

With larger assemblages, we can be more critical of the *context* and date of this information, rather than the date of the site as a whole. In so doing, perhaps we can move away from tables where data are presented solely on location (i.e. excavated site), because of the relatively low numbers of recorded items, to the examination, through greater numbers of recovered items, of properly chronological separated assemblages.

This then leads to questions of

1 chronologies

and **2** contemporariety.

As much of the data comes from deposits (ditch fills) that are not well dated, it is critical that both the fills and included environmental datasets from any new excavations are closely dated. This may require excavation of larger proportions of ditches and not just of simple slot-dug sections to recover artefacts. It may also require a rigorous policy of acquiring and examining material from these fills for radiocarbon dating (as for Stonehenge itself, Bayliss *et al.*, this volume; Allen and Bayliss 1995). If, then, groups of contexts are dated or related to close ceramic affinities this can be related to the plant, bone or snail assemblages, providing a more accurate ascription of time.

However, in order to examine development within a *landscape*, it is necessary to ensure that datasets can be related between sites to ensure contemporariety or succession. Here again the careful and considered use of radiocarbon dating programmes is called for. Although it must be admitted that the programme from Stonehenge was large, expensive, and was rigorously interrogated, it is not absolutely necessary to employ similarly large dating programmes at other monuments. However, in order to achieve comparability between palaeo-environmental databases from sites to enable the fine-grained mosaic of land-use history to be obtained, it is imperative that well-dated chronologies are obtained for *all* the main monuments in our defined study area.

With the publication of both *SEP* and *Stonehenge in its landscape* it has, at last, been possible to go some way to examining both the landscape and the monument. We can now only really progress significantly by the acquisition of both larger, and better dated, environmental assemblages. The addition of continued small-scale analyses, such as the recent work summarised here from the Lesser Cursus and Coneybury Hill, no longer make a significant contribution to our understanding of the use of the landscape as a whole, only of specific individual locations within that landscape.

An outline programme for the future

- selected medium-scale excavations of a number of sites to obtain closely dated environmental data, especially from buried old land surfaces
- an attempt to acquire data which relate to the domestic animal and crop husbandry with an aim of defining the relative importance of each for any designated phase/period
- acquisition and careful dating of long sequences of non-site environmental data (pollen from alluvial sequences and snails from suitable colluvial sequences)
- a radiocarbon dating programme to enable the construction of detailed site chronologies (to relate to events and environmental datasets), and enabling the comparison or absolute sequence and contemporariety between sites.

Concluding comments

Stonehenge and the surrounding area is, of course, a wonderful and special landscape, but it is not isolated from everyday life and it is the latter that I have concentrated on because it provides the evidence for the economy within which the monument was built and sustained.

Both Startin and Bradley's (1981) and Renfrew's (1973) calculations show that the construction of Stonehenge was achievable by a finite number of people over relatively short time scales. Nevertheless this large working population needed to be fed, clothed and housed. What the environmental data show is that the Stonehenge landscape was capable of sustaining such a population through a mixed agrarian economy, including relatively widespread arable cultivation (Plate 5), and through the evident flocks of sheep and herds of cattle. Thus, in a landscape with a reducing biodiversity and communities increasingly managing resources, we have the opportunity not only for the large-scale deployment of labour, but also of a hierarchical or stratified society, and one with wealth to trade, barter and impress other communities. This rich mixed farming economy underpinned communities in the region providing the community wealth and enabling it the luxury of engaging many of its folk in activities not related to the acquisition of food and vitals for the stomach but for food for the mind, head and heart.

The following points may be made by way of conclusion.

1 The development of farming communities with a mixed agrarian economy and less necessity for mobility occurs at the same time as the requirement of a significantly increased manpower to construct the phase 3 monument.

2 There is evidence for large-scale settlement immediately adjacent to the Stonehenge triangle in the form of large and extensive pottery scatters (Allen and Cleal 1995, figs 253–5). The argument that there is no domestic settlement in the area may be simply the result of the fact that we do not know exactly what we are looking for, as structural evidence for the Late Neolithic/Early Bronze Age everywhere is extremely sparse (see Gardiner 1996). Further, that even if substantial Neolithic domestic structures were built (see Wyke Down, Cranborne Chase, Dorset), they may have left relatively limited traces and since investigations involved with the *Stonehenge Environs Project* concentrated largely on plough-damaged monuments and did not excavate the centre of any of the defined Neolithic pottery scatters, it is not surprising that no domestic structural evidence was recovered.

3 There is evidence for utilitarian activity during all three phases of construction, but the environmental evidence, independent of any cultural remains, clearly shows that the work-force must have resided in the local landscape, and was fed, clothed, sheltered and cared for within the local community rather than being 'bus-ed' in on a regular basis.

4 This idea therefore contradicts any suggestions of exclusion from the landscape (e.g. Barrett 1994; Thomas 1991; Richards 1984; Garwood, pers. comm.). Archaeologists' reasons for suggesting exclusion relate to their own twentieth century perception of the importance of the monument; however, it seems somewhat profane to exclude the communities who may have revered or used it from the area around it.

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MICHAEL J. ALLEN

Environment and land-use; the economic development of the communities who built Stonehenge (an economy to support the stones)

Quaternary scientists and archaeologists employ palaeo-ecological evidence to investigate the development of past landscapes. Unlike their earth science colleagues, however, archaeologists use the interpretation of these data to illustrate and explain *human* action.

Stonehenge was constructed and reconstructed over a period of 1500 years. The communities providing work-forces for this enormous labour must have been large, structured and have operated under strong political control. Most importantly they had to be locally resident and capable of sustaining both the labour-force and residential population. But how was this possible for simple prehistoric farming communities 5000 years ago?

The secure economic base underpinning these communities required long-term investment. By employing palaeo-environmental analyses to examine the development of the prehistoric landscape and land-use in the Stonehenge region, we can provide an explanation of how that landscape was used to support a highly organised society and enabled the diversion of human resources for the construction of Stonehenge.

ALASDAIR WHITTLE

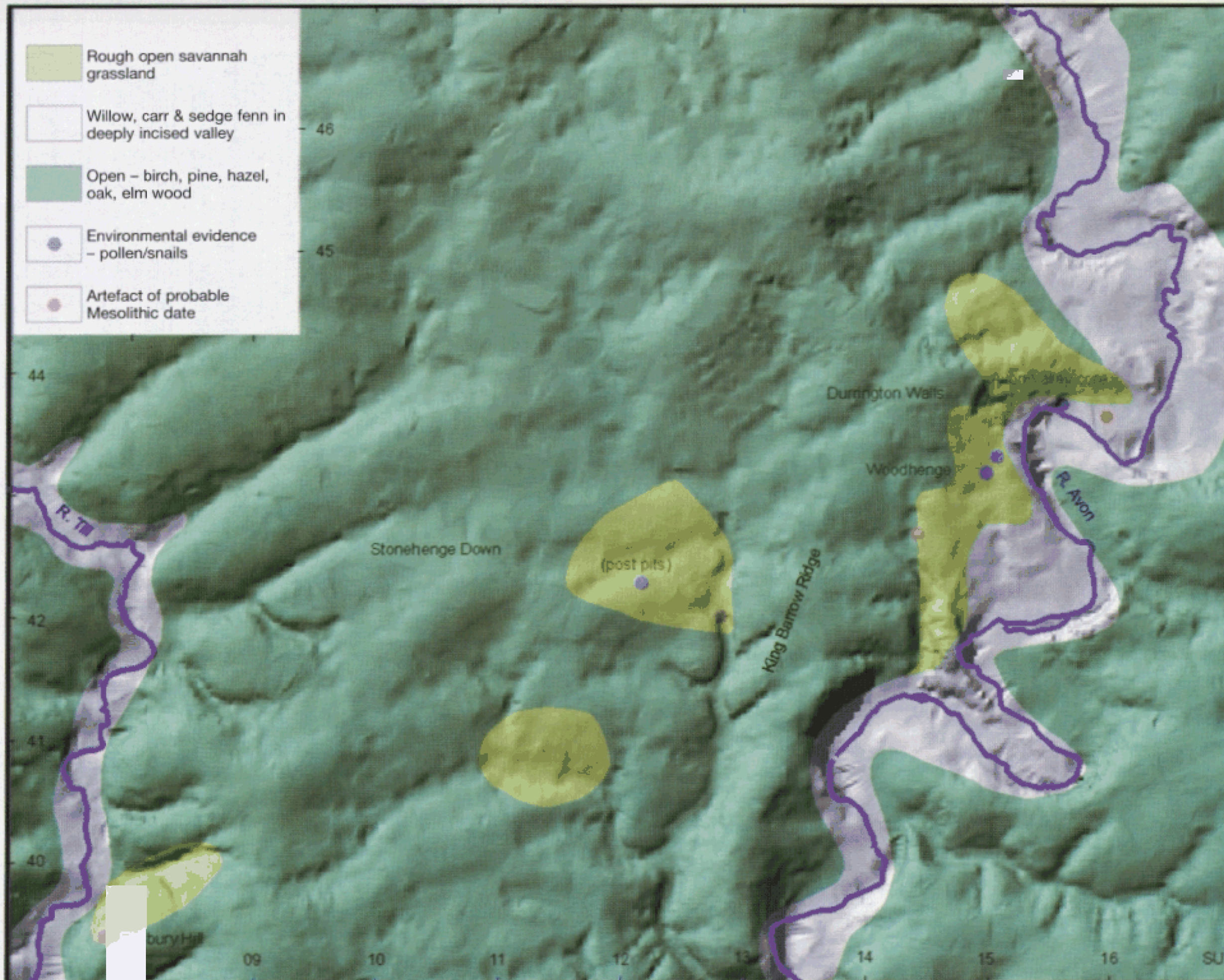
Remembered and imagined belongings: Stonehenge in its traditions and structures of meaning

Meanings can be ascribed to Stonehenge, especially in its main phase of lithic monumentality in the Later Neolithic, by considering: its contemporary setting; the tradition of sacred monuments, circular and other, to which it belonged; the layouts of successive phases; the materials from which it was formed; and the patterns of approach and experience which the monument may have engendered.

TIMOTHY DARVILL

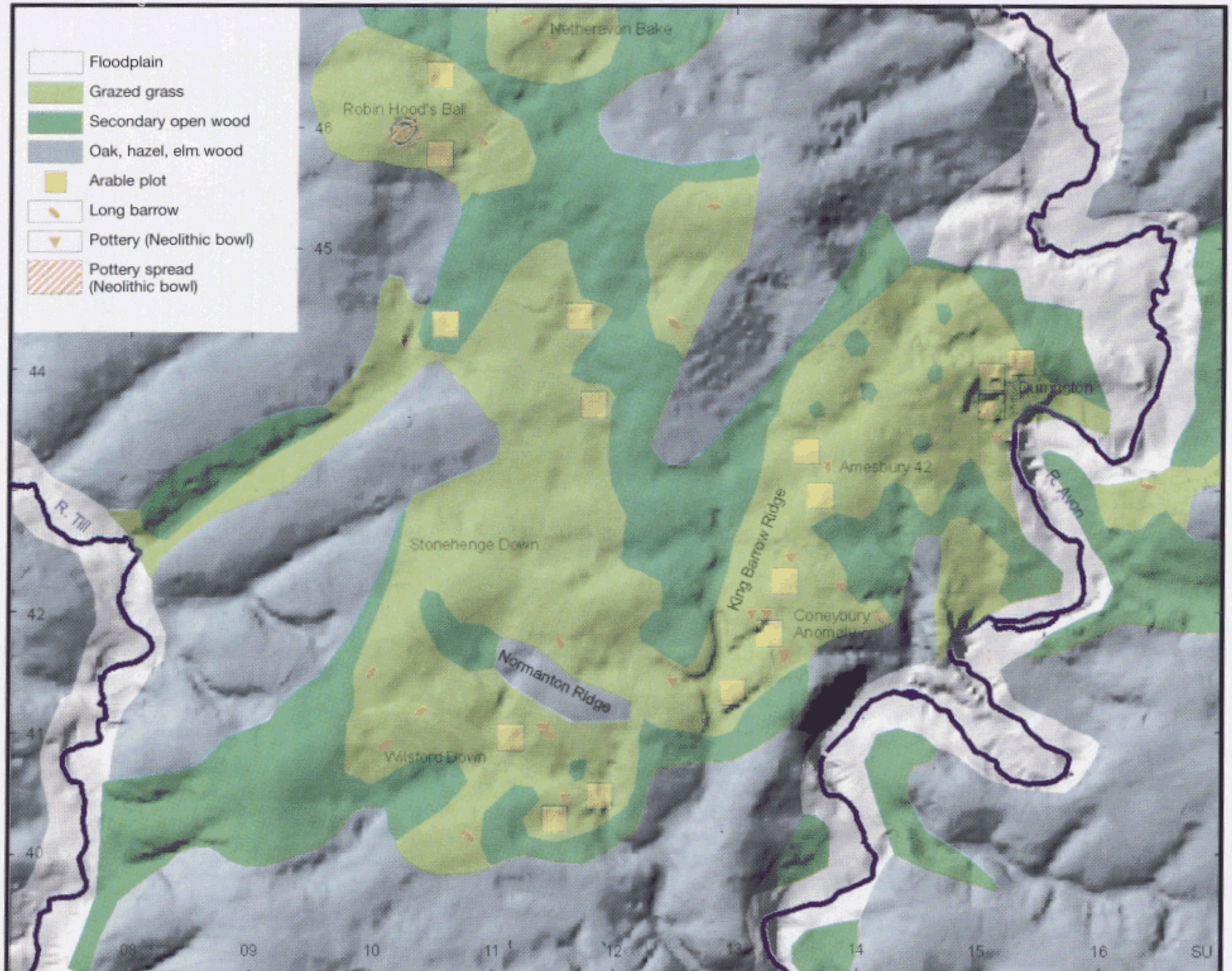
Ever increasing circles: the sacred geographies of Stonehenge and its landscape

Using perspectives from sociology and social archaeology, this paper explores the changing meaning and use of Stonehenge and its immediate environment from *c*.4000–1000 BC. Distinctions are drawn between 'space' and 'place' to understand the development of certain sites, while the principle of structuration is used to show how ideas find expression in material culture, monuments, and landscape organization. Although Stonehenge had special significance for more than 2000 years, the successive structures reflect ever-changing relationships between people, their beliefs, and the cosmological systems of



Vegetation and land-use in the Stonehenge landscape in the Mesolithic (8100–7100 cal BC)

PLATE 2



Vegetation and land-use in the Stonehenge landscape in the Early to Middle Neolithic; pre-phase 1 (4000–3000 cal BC)

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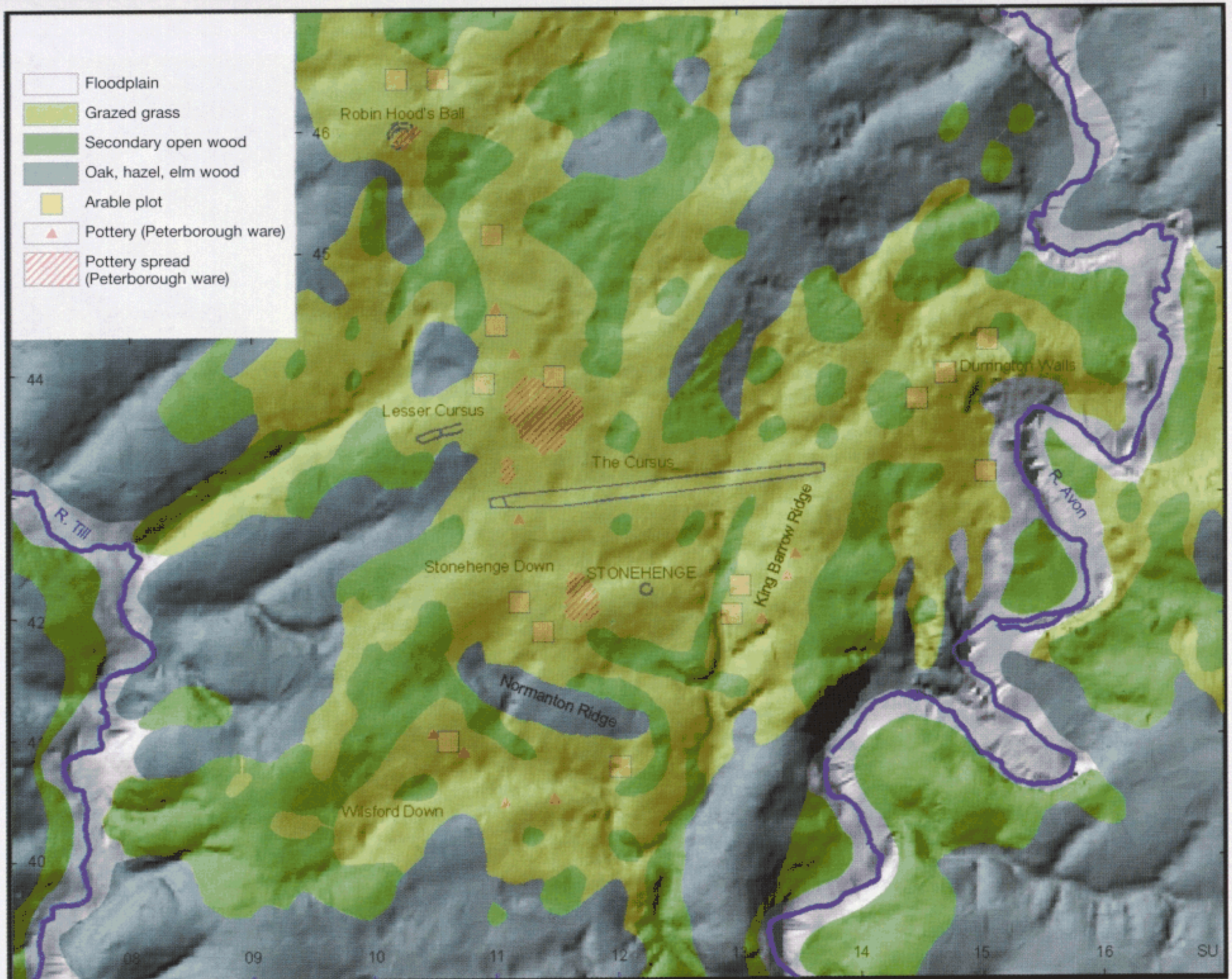
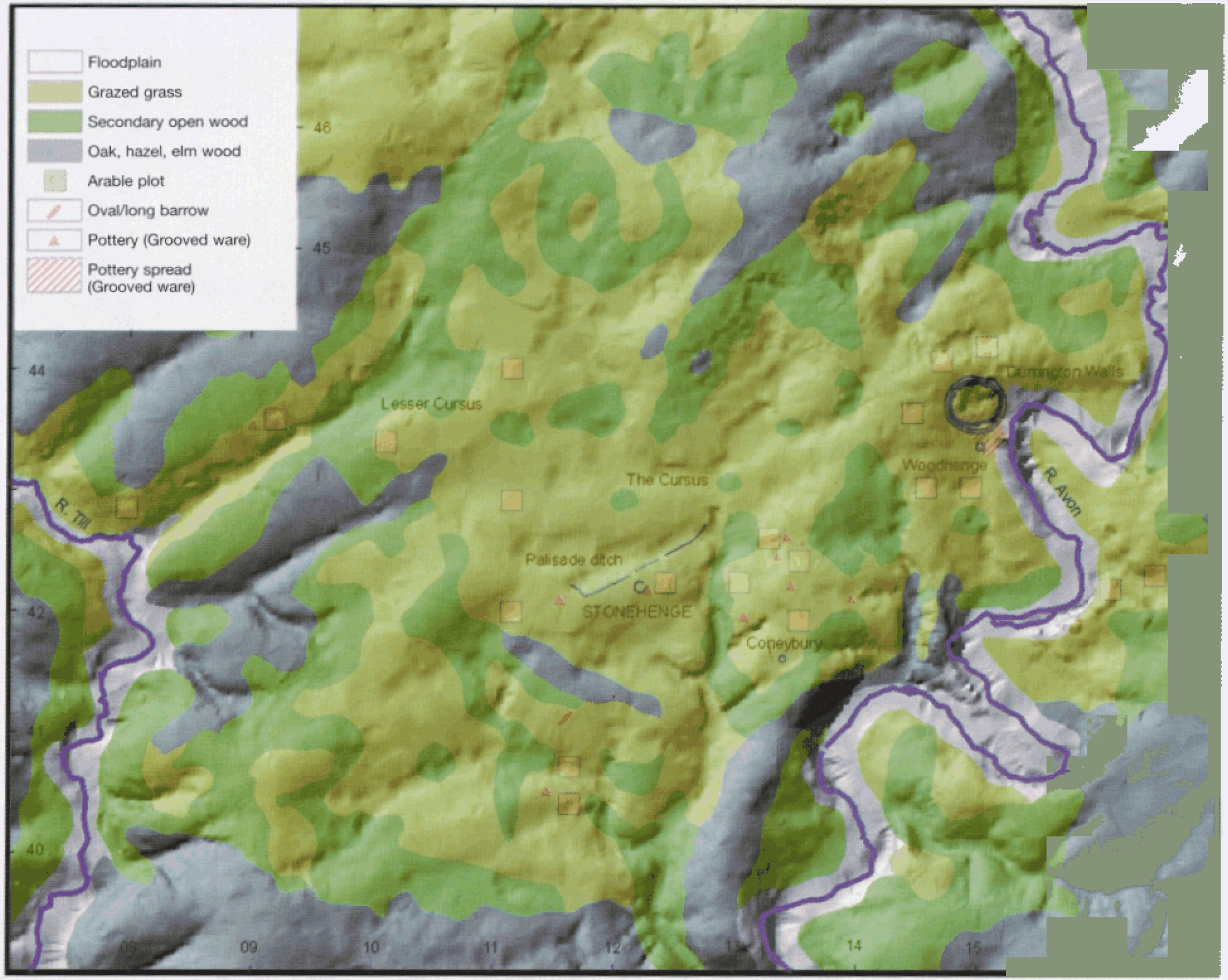


Vegetation and land-use in the Stonehenge landscape in the Middle Neolithic; phase 1 (2950–2900 cal BC)

PLATE 4



Vegetation and land-use in the Stonehenge landscape in the Late Neolithic; phase 2 (2900–2400 cal BC)

Vegetation and land-use in the Stonehenge landscape in the Late Neolithic/Early Bronze Age; phase 3 (2550–1600 cal BC)