Book:

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CHAPTER TWO

Interpreting Site Distributions

'sunny slopes between 1,200 and 1,500ft being favoured localities overlooking spring heads'

Barnes (1982: 25)

'A sheltered aspect not far from the tops of hills and ridges also seems to have been sought: in south-west Yorkshire, most of the sites are found in the 415-500m zone, on sites facing east through south and off the crest'

Simmons (1996: 33-34)

ABSTRACT

The first source of evidence for the Mesolithic occupation of northern England has traditionally been the archaeological record. In this chapter, the archaeological evidence for past population and settlement in northern England, and how it has been interpreted, the 'top down' approach, are considered. In theory, evidence for changes through *time* in the numbers of Mesolithic sites can potentially tell us about population changes. Patterns through *space*, the spatial distribution of sites, on the other hand, have been interpreted in terms of processes ranging from large scale distinctions between potential social territories, to settlement patterns, to the way in which local landscapes were exploited, all of which are important as the contexts for changes in population. It is demonstrated here that none of these distributions are free from bias, and different types of biasing factors have different effects at different scales. Unfortunately, it even appears that, on closer scrutiny, the evidence for the Mesolithic occupation of northern England is much more biased than it might at first appear. Because of this, commonly accepted interpretations may be based on 'false patterns' occurring at different scales. The implications of these 'false patterns' are discussed. Although there may be some genuine patterning which relates to Mesolithic activities, this patterning is difficult to determine and not necessarily explainable through currently accepted models. Clearly the archaeological evidence, as it stands, is insufficient for a 'top down' approach to provide a better understanding of large scale Mesolithic adaptations. The evidence available for an alternative 'bottom up' approach, based on subsistence resources, is addressed in chapter three.

The first 'port of call' in any interpretation of Mesolithic activities is the archaeological record, the 'top down' approach as it is dubbed in chapter one. The archaeological record for the Mesolithic in northern England is however somewhat limited, not in the volume of evidence, there are over 1,900 sites, but in the quality of what is preserved. Almost all the evidence which we have consists solely of 'flint scatters', assemblages of stone tools and debitage, perhaps associated with hearths, or even with luck other features such as post-holes. Exceptional sites, with organic preservation, do exist (Star Carr, Clark 1954, being one particular case) but these are extremely rare.

The distribution of Mesolithic sites, and differences in the composition of artefacts between sites, could be a major source of evidence for Mesolithic adaptations. However, these distributions are clearly complex and can not 'speak for themselves'. Even determining what characteristics of these flint scatters could be used to define as a 'site' is difficult (Schiffer 1987; Haselgrove, Millet and Smith 1985; Schofield 1991; Dunnell 1992; Spikins 1995c). Our present understanding of what patterns in the archaeological record say about Mesolithic activities has been built up over many decades. One of the main inspirations being clear patterns observed in the way in which known hunter-gatherers discard artefacts within a seasonal settlement system (Binford 1978; 1980; 1983; Thomas 1981; Wandsnider 1992). As a result, several key ideas which structure our understanding of the archaeological record at a number of scales have their roots in ethnographically derived concepts (discussed in detail in chapter four), from distinctions between 'summer' and 'winter' sites, to ideas of contrasting upland and lowlands patterns of activities for example.

Patterning in the archaeological evidence can be crudely divided into patterns of change through time, and those of variations in space (the distribution of sites). Temporal changes are coarse-grained, since the typological phases of the Mesolithic are broadly defined and only a limited numbers of sites have been dated by absolute methods. Temporal changes in the *numbers* of Mesolithic sites can potentially provide evidence for changes in populations, while changes in the characteristics of sites may relate to other changes in adaptations. Interpretations of distributions in space are rather more fine-grained, and can be coarsely approximated at three different scales (**figure 2.1**). These three different spatial scales of site patterning are illustrated here by 'focusing in' from the scale of the whole of northern England, to that of the Pennines, to that of one area of moorland, Marsden moor. To provide the best potential for interpreting the evidence at each scale, the region with the highest density of sites is selected at each successive stage of the 'focusing in' process. At the large scale, distributions of sites may potentially provide evidence for past Mesolithic territories or the limits of 'social group', at the medium scale, for settlement patterns or the 'seasonal rounds' of groups, and at the small scale for activities in a local landscape. A few interpretations even involve considering changes in the characteristics of sites over both time and space. The interpretation of patterning and the potential effect of different biases on interpretations will be considered in turn.

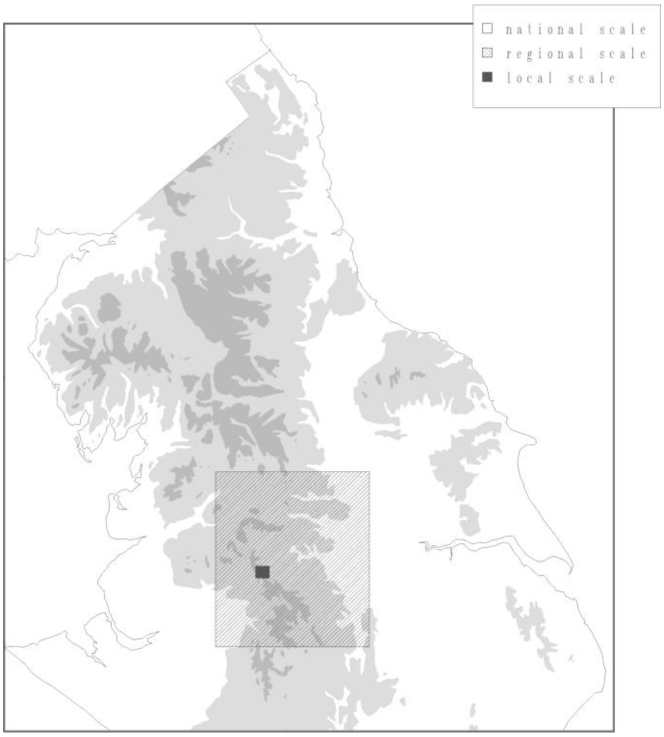


Figure 2.1 Scales of Spatial Patterning.

VARIATIONS OVER TIME

Taking first the patterning in sites over time, and how this patterning is commonly interpreted. The clearest element of this patterning is an increase in the numbers of archaeological sites (as discussed in chapter one). Recorded increases in site numbers in Britain appear to be clear-cut and fit in with marked increases in Mesolithic sites recorded in the rest of Europe. Newell (1973: 408) for example documents increases in the numbers of sites of successive periods in the Northwest European Plain, with a threefold increase in the Late Mesolithic.

The apparent evidence for increases in the numbers of archaeological sites through time comes from two sources - changes in the numbers of sites which can be grouped into phases according to artefact types (typology), and those which have been given an absolute date using radio-carbon dating techniques.

Sites dated by typology in Britain are basically assigned to one of two phases, the 'Early' Mesolithic or the 'Late' Mesolithic. Assemblages dating from the Late Mesolithic are distinctive in containing much smaller microliths than those of the Early Mesolithic (with the exception of the Irish 'Larnian', Woodman (1978a; 1978b)). Other distinctions in raw material use and in other characteristic types of artefacts between the two phases, such as scrapers or blades, often vary regionally, and are discussed in detail by both Jacobi (1976) and Myers (1986).

A number of authors, notably, Jacobi (1976), Morrison (1980: 136) and Myers (1986) note clear increases in the numbers of sites which can be typologically assigned to the

Late Mesolithic in Britain, over those assigned to the Early. In fact, Jacobi (1976) notes a six-fold increase in Late over Early Mesolithic sites, from a database of 108 sites.

The alternative source of evidence for changes in the numbers of sites is the record of radio-carbon dated sites. Smith (1992b) refers to the numbers of radio-carbon dated sites in Britain, and also demonstrates clear increases in sites dated by this method (**figure 2.2**). Similar increases are also seen within northern England.

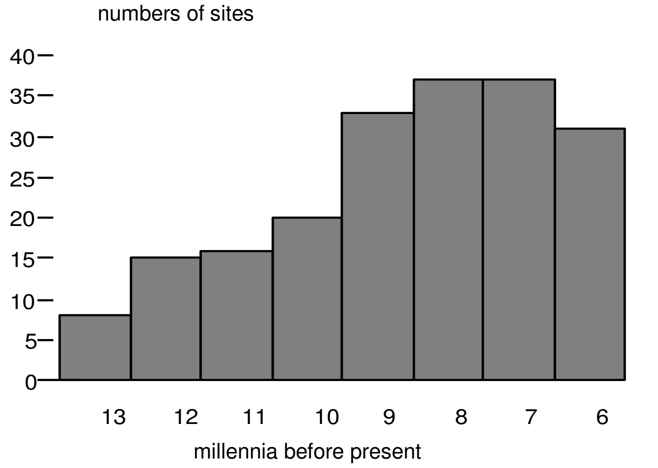


Figure 2.2 Radio-carbon dated sites in the British Isles (after Smith 1992).

The increase in Mesolithic sites through time is even clear at much smaller scales. Differences in the numbers of sites from each phase can be seen in the area studied in detail at the 'medium' scale, the Central and South Pennines[1] (**figure 2.1**). Although of the 335 sites in this database only 81 could be clearly distinguished as either Early or Late (because of the paucity of documentary evidence from collected assemblages), of these, 23 sites were dated to the Early and 58 to the Late Mesolithic (with 4 having finds from both periods).

Clear increases in the numbers of sites in predominantly inland environments are particularly significant in that they provide some initial hope for using gradual population increase as a defining feature of the *inland* Mesolithic occupation, as well as that for coastal 'complex' societies, an issue raised in chapter one.

[1] The site locations and characteristics (Appendix A) are derived from the Sites and Monuments Record (SMR) housed at West Yorkshire Archaeology Service, courtesy of Bob Yarwood and Jenny Marriott, and from the SMR of the Greater Manchester Archaeological Unit, courtesy of Norman Redhead. South Yorkshire SMR and Derbyshire SMR (Sue Whitely and Andy Myers respectively) also contributed data, although since the characteristics of sites were restricted to general terms, only the locational data was used here (as illustrated in figure 2.6).

VARIATIONS IN SPACE

LARGE SCALE DISTRIBUTIONS

At the 'large' scale, that of the whole of northern England, most researchers have been interested in determining first the edges of territories of distinct human populations, and secondly, the patterns of distinct settlement systems, or seasonal rounds.

Considering the distribution of Mesolithic sites over space, the 'large scale' patterning of site locations *alone* has received only limited interest. This may be because it is difficult or time-consuming to collect together the large volume of available material for British Mesolithic sites into a database. No database of Mesolithic sites for the whole of Scotland exists for example. Alternatively it may be because it is difficult to relate the distribution of sites alone to these types of questions. In contrast, the distribution of the apparently 'stylistic' elements of a limited set of sites which have been analysed in detail have been subject to much closer attention and certainly appear to provide important evidence for both territories and for settlement systems.

The Sites Alone

The main source of evidence for patterns in the distribution of sites alone, at the large scale of northern England (and indeed for all of England and Wales) has been derived from Wymer's (1977) gazetteer of Mesolithic sites. This gazetteer includes several thousand recorded 'sites' (or unique find spots of Mesolithic material), the northern England component of which (1,987 sites) is illustrated in **figure 2.3** (data from Castleford 1987, after Wymer 1977).

Although the wealth of locational evidence presented in this gazetteer is remarkable, few direct interpretations of this patterning have been put forward. Using this distribution (mapped according to a 10km^2 grid), Smith and Openshaw (1990: 21) have nonetheless noted potential differences in population density across England and Wales as a whole. They tentatively define '*two broadly defined demographic provinces; one in the south and the other in the north and east, with a thinly occupied central zone in between'*. Much of northern England lies in the north of these zones, with the Midlands forming an apparently thinly occupied zone between the two regions.

Assemblage Characteristics

More interesting patterns emerge when the distribution of assemblage characteristics is viewed at a national scale. Jacobi (1976; 1979: 73) analysed a selection of 54 artefact assemblages from across England. He compared the different types of microliths in each of the assemblages (using cluster analysis) to see which assemblages were more closely related to each other, or exhibited what could be called a common 'style'. He suggested that the distribution of these different types of flint 'industries' at the national scale may relate to distinct 'social territories' in the Late Mesolithic (**figure 2.4**). Much of the variability which he notes however relates to differences within southern England, with only two of these 'social territories' apparent in northern England. Specifically,

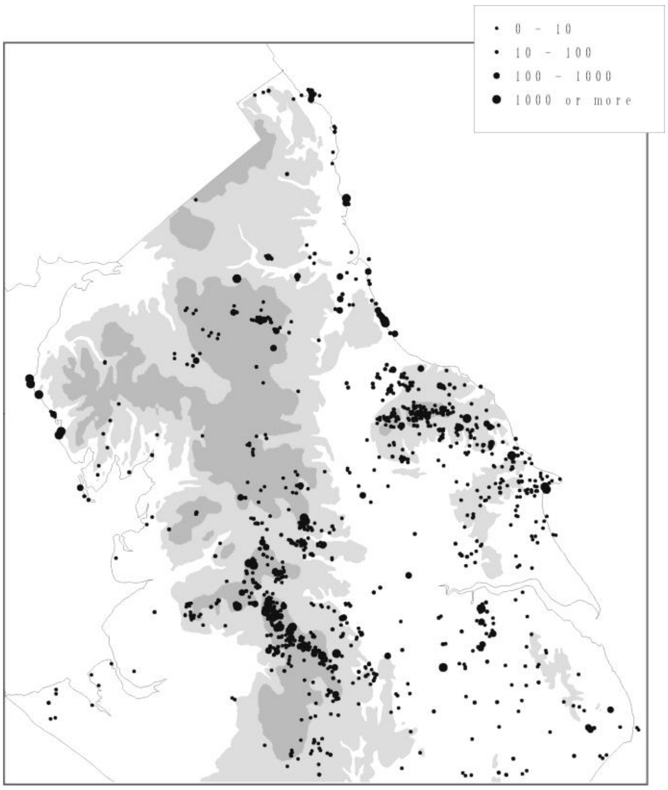


Figure 2.3 Mesolithic sites in northern England.

he suggests that *northern straight-backed bladelet type assemblages* or *March Hill industries* dominate all of eastern northern England, except for an area of *Midlands/East Anglian type* assemblages in the south-east of the region (south of the Humber). Jacobi did not classify the west of the Pennines into any typical assemblage type or social territory.

Combining an analysis of lithic assemblages and how these *change* through time with the distribution of sites also reveals some interesting patterns which appear to be related to *changes* in social territories. Both Jacobi (1976; 1978) and Myers (1986) have analysed the raw material of Early and Late Mesolithic sites in detail. They note that there is a reduction in the distance over which raw materials are transported from Early to the Late Mesolithic, particularly in the Pennines. In fact, flint raw materials used on Pennine sites in the *Early* Mesolithic are derived from the Lincolnshire and Yorkshire Wolds (with Early Mesolithic assemblages largely containing over 90% white 'Wolds flint' and in many cases 99% of this material - Jacobi 1976, III. 21; Myers 1986: 311: table 9). By the *Late* Mesolithic however, raw materials came almost exclusively from local sources. Similar patterns of changes have also been noted in the rest of Britain (Care 1982) and in the rest of Europe (Price 1983; Gendel 1984; Verhardt 1990; Vang Petersen 1984) and are interpreted as relating to a reduction in the size of territories exploited by hunter-gatherer groups, in line with increases in population (as described above), thus providing further support for this concept.

Some changes in the character of sites through time are somewhat harder to interpret. One of the most obvious, and not necessarily easily explicable pattern, is that there is a sharp distinction between Early and Late Mesolithic sites in northern England (with no transitional industries being recovered). Transitional industries, such as 'Horsham' industries, do appear to exist in the south of England (Jacobi 1976). Myers (1986; 1989) also notes that the character of upland sites also appears to be distinctly different after the transition. Late Mesolithic sites apparently appear to be smaller and more widely distributed across the landscape than Early Mesolithic sites (although Myers doesn't quantify these distinctions). Myers links these changes to changes in strategies used to hunt red deer in the uplands, proposing a change across the Early to Late Mesolithic transition from an 'intercept' hunting of migrating herds of deer to an 'encounter' hunting of individual animals.

In certain situations there appears to be sufficient evidence to link sites with similar 'stylistic' characteristics into a defined settlement system. Both the distribution of raw materials noted by Jacobi (1976; 1979: 73) and the distribution of sites provide a further source of information. Clark (1972) interpreted Star Carr as a lowland winter base camp, contrasting with upland summer hunting sites. Jacobi (1973: 244; 1978: 304) built on this basic settlement pattern, and on Early Mesolithic raw material movements (noted above) to interpret the existence of concentrations of sites in the Lincolnshire and Yorkshire Wolds, 'complementary' to the cluster of sites in the Pennines, (**figure 2.5**) as winter camps. He argued that groups who occupied the Pennines in the summer would have over-wintered at the Lincolnshire Edge.

REGIONAL SCALE DISTRIBUTIONS

At the regional scale, interpretations have focused on

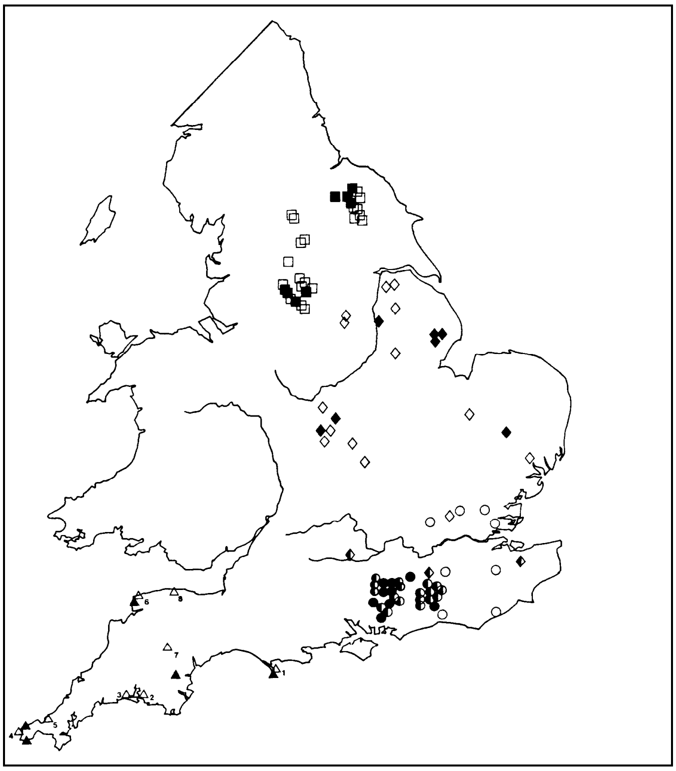


Figure 2.4 Potential 'social territories' according to assemblage types in England (after Jacobi 1979: 68). Different assemblage types are denoted by different symbols, only the in-filled symbols were incorporated into the cluster analysis, the open symbols are additional assemblages.

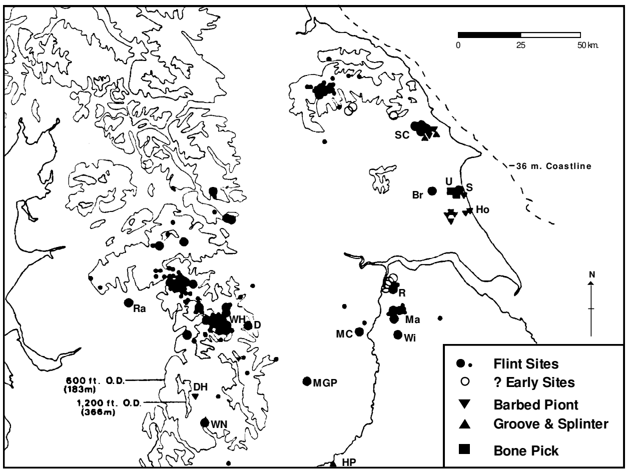
identifying the types of activities which occur in different environments, as well as providing specific explanations for differing distinct local patterns.

Distinct contrasts between *upland* and *lowland* sites become apparent at the regional scale. In terms of the distributions of sites alone, there appears to be a physical separation between sites in the two zones, with few sites in ‘intermediate’ locations. Thus, in the Central Pennines, upland sites are almost exclusively above about 350m OD (that is, above present sea level) with lowland sites below 100m OD. It is also noticeable that most upland sites occur within a restricted band of elevations, with upland sites being rare above 450m. The distribution of sites does not appear to relate to the most obvious bias, patterns of upland peat erosion, as erosion tends to be most severe at higher elevations. Jacobi, Tallis and Mellars (1976: 308) comment that *‘at the highest altitudes where peat erosion is most severe few mesolithic sites have been recorded’.* Indeed, a map of the most severe peat erosion (shown for the southern Pennines after Phillips, Yalden and Tallis. 1981) and known Mesolithic sites (from the database compiled here) clearly illustrates that the ‘band’ of Mesolithic sites is quite distinct from the area of severe erosion, **figure 2.6** (the area illustrated is approximately 60km by 60km).

An important clue to the distinctions between upland and lowland sites has come from comparisons of selected artefact assemblages. Mellars (1976) compared upland sites (from across England and Wales), characterised by assemblages dominated by microliths and by small site dimensions, with larger lowland sites, of which there were two types, commonly dominated by scrapers. Microliths are usually interpreted as the ‘barbs’ for arrows used in hunting, and scrapers as used in ‘domestic’ activity. On the basis of models from ethnographic sources (discussed in chapter four) Mellars interpreted the small upland sites as ‘hunting camps’ likely to be occupied in the summer, and lowland sites as more likely to be longer term occupation, or ‘base’ camps, occupied in winter. The distributions of sites at a regional scale, noted above, confirmed the idea of distinct upland hunting grounds (Jacobi 1978), above which there was little occupation. Following Clark (1972) it was widely suggested that the use of the uplands was probably restricted to the summer months (Clark 1972; Mellars 1976), when hunting deer.

Contrasting local patterns are also a component of observations at the regional scale. Certain local areas have very high relative densities of sites, which have been interpreted by early researchers to be a result of movements of populations through key areas. However, complex patterning in the assemblage characteristics of sites at the regional scale has also been determined, and which is much more difficult to interpret. Several researchers have noted that upland sites can be markedly varied in their assemblage characteristics, and moreover, that different ‘styles’ of assemblage can overlap within the same region.

The most obvious concentration of sites is that at Marsden moor, the area chosen as the local example here. Marsden moor is in fact the location of the *highest* density of recorded Mesolithic find locations in England and Wales. Buckley



Distribution of Early Mesolithic sites in northern England. Br - Brigham; D - Deepcar; DH - Dowel Hall Cave; Ho - Hornsea; HP - Holme Pierrepoint; Ma - Manton Warren; MC - Misterton Carr; MGP - Mother Grundy's Parlour; Ra - Radcliffe Ees; R - Risby Warren; S - Skipsea; SC - Star Carr; U - Ulrome; WH -Warcock Hill; Wi - Willoughton Site A; WN - Wetton Mill Minor Rock-shelter.

Figure 2.5 Concentrations of Early Mesolithic sites in the Pennines and Yorkshire Wolds (after Jacobi 1978: 304).

(unpubl.) interpreted these high densities in terms of the topography, although later authors have not determined any obvious explanation (Stonehouse 1990). Since this region is at the narrowest part of the Pennine chain, Buckley supposed that Mesolithic populations moving north-south along the Pennines were constricted into a smaller area at this point and left behind higher densities of artefacts. A similar explanation for relatively high concentrations of find locations has been proposed in other areas, such as for Rombalds Moor (**see figure 2.6**) by Cowling (1946). He suggested that Rombalds Moor may have been a key passing place across the Pennines throughout Prehistory, and that this location may explain the concentration of Mesolithic (and Neolithic) sites.

Differences in the artefactual composition can add a great deal to an understanding of regional processes, although detailed analyses require a long-term commitment to analysing many assemblages. Fortunately, the sites within the Pennine area discussed here formed a major component of a number of national scale analyses (noted above), which have revealed distinct patterns at the regional scale. However, whilst contrasts in artefact assemblages appeared to be explainable at a national scale, potential explanations for regional patterns are much more difficult to identify.

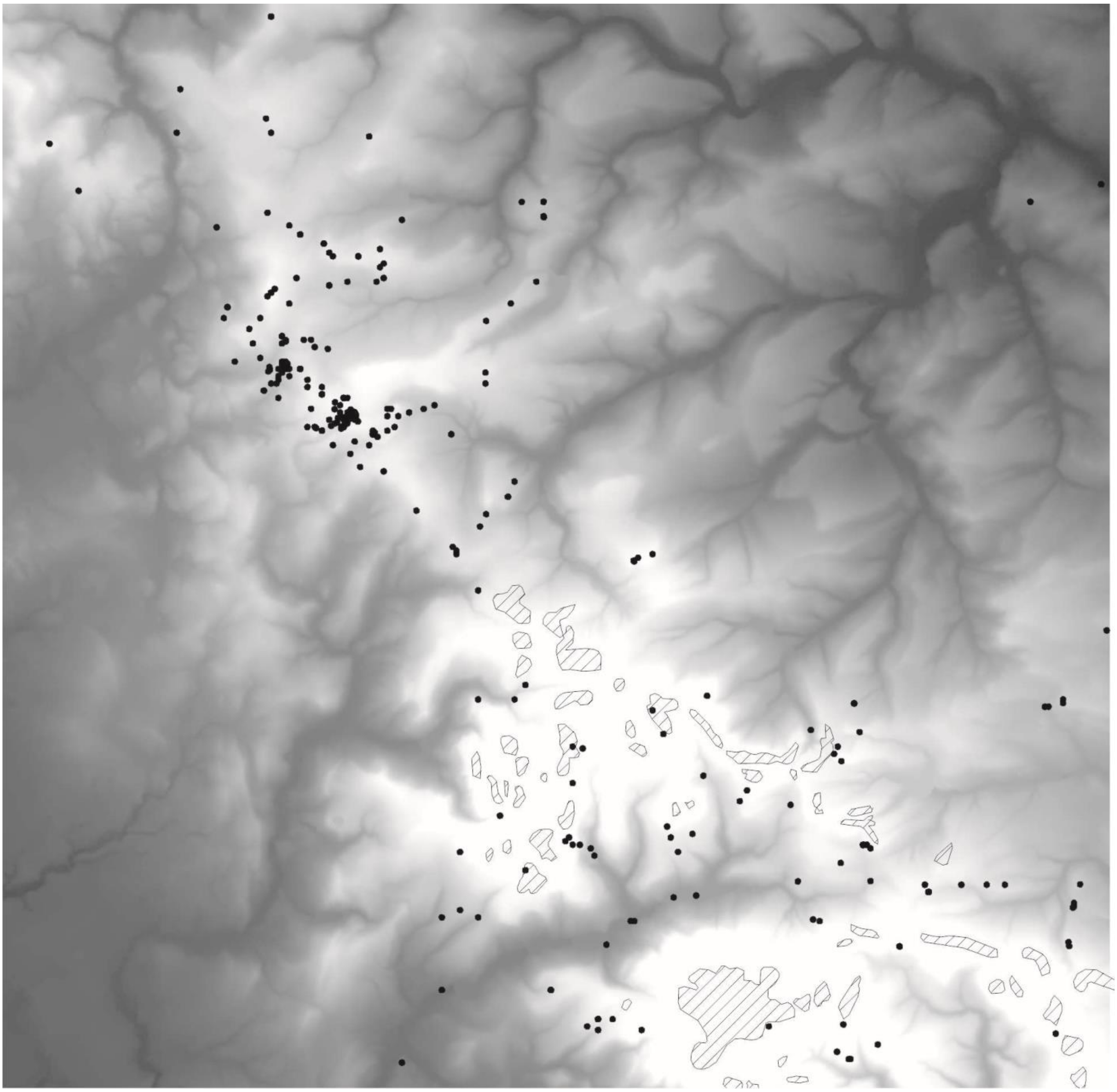


Figure 2.6 Sites in the southern Pennines and areas of most severe peat erosion.

In terms of the distribution of Early Mesolithic assemblages, one of the most interesting analyses including Pennine evidence is Jacobi's statistical analysis of a series of 108 assemblages from across England (Jacobi 1976; Switsur and Jacobi 1975; 1979) (noted above in reference to large scale social territories). Jacobi identified two distinct types of assemblages in the Early Mesolithic, which have different microlithic forms and raw materials. In the Pennines these two distinct styles are found in close proximity, having even been recovered from the same hillside (the sites of Warcock Hill South and Warcock Hill North). The former site, Warcock Hill South, appeared to be related to Star Carr in the Vale of Pickering, on the basis of stylistic traits and raw material sources, (Radley and Mellars 1964: 21), whilst the assemblage from Warcock Hill North has more local affinities. The potential explanations for these two site types are varied, and could include not only functional differences in the two types of sites, but occupation by different hunter-gather groups or even a chronological distinction between the two sites.

In the Late Mesolithic, the Central Pennines are again the focus of attention in Jacobi's study (Jacobi 1976; Switsur and Jacobi 1975; 1979) with two distinct assemblage types recovered here. As well as the most common 'March Hill industries' (dominated by 'scalene triangle' microliths) recovered from this area, there are also distinctive 'rod microlith dominated assemblages' (Jacobi 1976; Switsur and Jacobi 1975; 1979). These sites are only found in the Central Pennines and in the North York Moors. They tend to only occur at high elevations, (not in the lowlands), often being re-occupied, with the only raw material used being flint rather than the range of flint and cherts common in Pennine assemblages, (Jacobi and Switsur 1975; 1979). A recently excavated ‘rod’ microlith dominated site excavated at March Hill Top demonstrated all of these characteristics, and also contained a small hearth, with at least two phases of use, (Conneller 1995; Spikins, Ayestaran and Conneller 1995; Spikins 1995b). Again the evidence from these two types of assemblages may relate to functional or even social group contrasts, although chronological distinctions are a distinct possibility given the very late dates for these types of sites (Jacobi and Switsur 1975; 1979), especially since the dates from March Hill Top cluster at around 5,200bp (Spikins, Bayliss and Bronk-Ramsey, in prep).

Within the Pennines themselves, Marsden moor has again been the focus of attention in studies of distinct assemblage ‘styles’ as well as in reference to site densities. This area is one of only two local landscapes where very rare ‘pear’ microlith type sites have been recovered, (Jacobi 1976; Stonehouse 1987; 1990), the only other area being in the Lincolnshire Wolds (Jacobi 1976). The distributions of sites within Marsden moor are considered in more detail below.

LOCAL SCALE DISTRIBUTIONS

At the local scale, it is general patterns, apparently common to all upland distributions which have attracted the most attention. These general patterns are interpreted as relating, not only to the types of activities occurring in the uplands, but also to broader issues such as the long-term continuity of these activities through time.

The most notable element of small scale patterning is that most upland sites tend to be found at a specific elevation, at points from which there is a high visibility of the surrounding area, as well as tending to be found on south-facing slopes and at river heads, as clearly illustrated by the distribution of the large number of flint assemblages found on Marsden moor (**figure 2.7**), and the distribution of typologically dated sites in this area (**figure 2.8**).

Buckley (1924) was one of the first people to notice this patterning. He commented that

In this district (around Marsden), the sites chosen as workshops or camping grounds were comparatively small and well defined, situated on the tops and upper slopes of hills and ridges, and at least 1,250ft (381m*) above sea level.*

Radley and Marshall (1963: 96) later also commented that in the Central Pennines *‘Mesolithic sites prefer the 1,250-1,500ft zone* [381-458m] *on east to south-east facing slopes’*, and Barnes (1982: 25) interpreted ‘*sunny slopes between 1,200 and 1,500 feet* [366-458m] [as] *being favoured localities overlooking spring heads’*.

The most popular interpretation of these characteristics is that they are the preferred locations of Mesolithic populations, being probably the best ‘lookout’ sites for hunting groups, who may have been waiting for passing red deer. Thus, in discussing the use of the uplands by hunting groups watching for deer, Jacobi supports his argument by noting that Mesolithic sites are

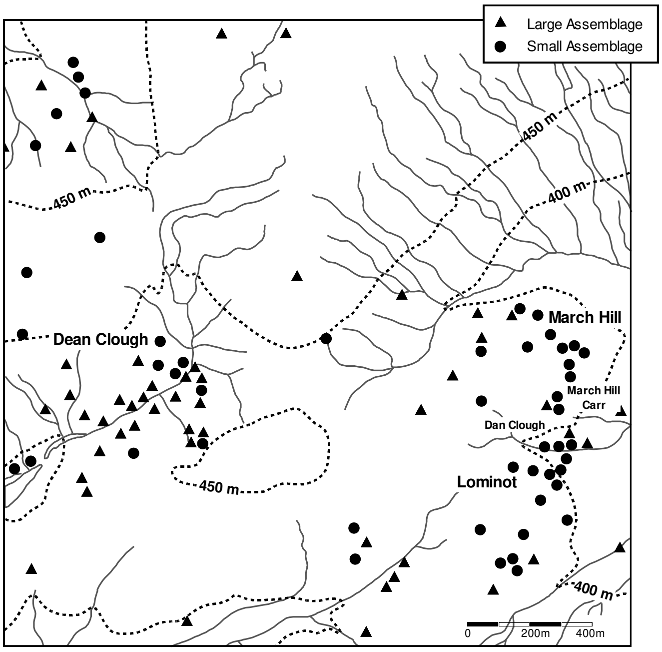


Figure 2.7 Mesolithic sites on Marsden moor (data from Stonehouse 1990).

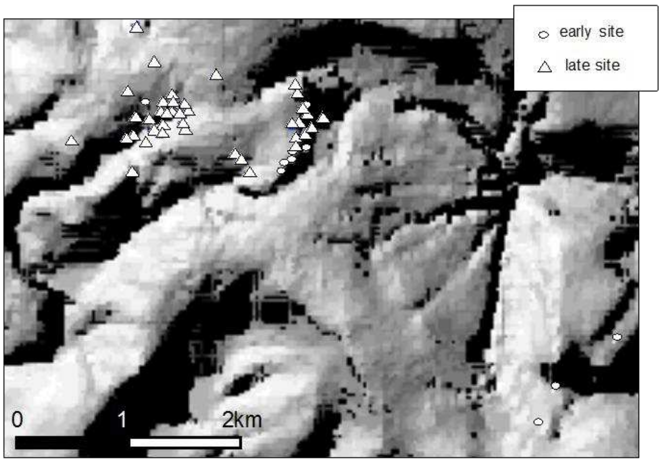


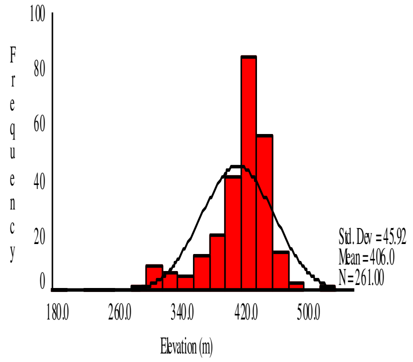
Figure 2.8 Early and Late Mesolithic sites on Marsden Moor.

‘*clustered on certain ridges, hills, ‘edges’, valley heads or eminences, each one controlling the maximum possible view...many of the sites overlook natural basins... situated to take into view the largest area possible’*
Jacobi (1978: 325)

Most recently, Simmons (1996: 33-34, cited at the beginning of this chapter) has drawn on this element of patterning, again using the Marsden moor example. He related the distribution of sites to a long term continuity of use of the uplands, both directly for the hunting of red deer, and indirectly through clearance of vegetation to increase the quality of browse for these animals. He interpreted upland clearance phases as intimately tied to the same types of location in which clusters of Mesolithic sites are recovered.

Also of importance is the *continuity* of upland activities across long time periods, a common and important theme tending to support ideas of a continuity and a stability of settlement. Common site 'preferences' link not only the Early and Late Mesolithic (Myers 1986), in Marsden (**figure 2.8**), the wider area of the Pennines, as well as elsewhere (Barton *et al.* 1995), but also the Mesolithic and Neolithic.

Elevation (sites)



Elevation (non-sites)

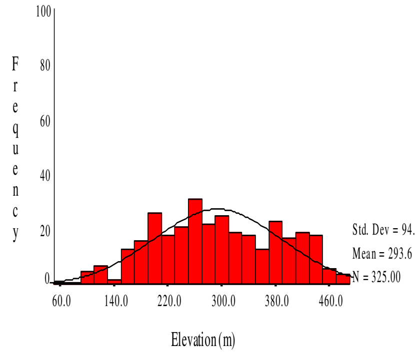


Figure 2.9 Elevation of sites and non-sites in the Pennines (after Spikins 1995c: 95).

Tilley (1994) strongly argues for continuity in the use of upland landscapes. Drawing on evidence for the same topographic preferences in south-west Wales, he argues for a more widespread continuity in the symbolic importance of particular 'locales' throughout the Mesolithic and Neolithic. He remarks on this '*continuity in the choice of locales and the exploitation and use of particular areas of the landscape*.' (Tilley 1994: 145), also noting that for Mesolithic populations '*evidence that these populations had a specific affinity with particular... locales and areas is overwhelming*' (Tilley 1994: 84).

Spikins (1993; 1995c) has attempted to quantify the regularities identified in site distributions in the Pennines. This work need not be presented here, but in simple terms involved comparing find locations (326 'sites'), and an equal random sample of points ('non-sites'), with coverages (maps) of elevation, slope, aspect and distance to minor and major streams (generated from topographic data at 50m resolution). The relationship between the types of landscape in which sites were recovered, and the more general characteristics of the wider landscape were thus able to be analysed statistically. Several elements of patterning were identified as statistically significant (using logistic regression techniques) however Spikins (1993: 1995c) noted that some of the patterning is likely to be a product of biases in the visibility of artefacts or the actions of collectors. There were however several key elements of patterning which were difficult to explain by reference to these factors. Spikins concluded that the elevation of sites, and the aspect (the direction in which the sites face) related to genuine preferences exerted by Mesolithic populations. A plot of the distribution of elevation values for 'sites' and 'non-sites' for example demonstrated that the find locations showed a restricted distribution across the possible elevations, a characteristic also noted by Buckley (1924) Mellars (1986) and Stonehouse (1990), (see **figure 2.9**). Equally, the distribution of recorded site values for aspect shows a tendency for find locations to be preferentially located on south-east facing slopes, which was interpreted as relating to the locations most attractive for hunter-gatherers, receiving the most heat from the sun, and thus being the driest and warmest spots.

Kvamme and Jochim (1985) also noticed similar patterning to that identified above when statistically analysing the locations of upland Mesolithic sites in Germany. They also interpreted the patterning shown as difficult to relate to known biases, and therefore most likely to be a result of 'real' preferences exerted by Mesolithic populations.

It is also worth noting that evidence for specific activities which were carried out in the uplands is also recovered from *within* sites. In fact, a further scale of analysis within Marsden moor itself *could* be defined, particularly at a series of recently excavated sites on March Hill and Lominot. Here the distribution of artefacts has been analysed in detail and related to several separate sequences of knapping activities around central hearths (Spikins 1994; 1995c; 1996; Spikins, Ayestaran and Conneller 1995). The intra-site scale is not included here in more detail as the interpretations at this scale rarely relate to the large-scale processes of adaptation which are addressed here. Moreover, distributions within sites are subject to different types of biases than those addressed here (Spikins Ayestaran and Conneller 1995, for example, discussed recovery biases on excavated sites). A detailed discussion of evidence at this scale, and interpretations of this evidence can be found elsewhere (Spikins 1994; 1995c; 1996; Spikins, Ayestaran and Conneller 1995).

A final point to be made before proceeding is that the distribution of sites within local, regional or national landscapes are not a component of all interpretations of Mesolithic adaptations. Some studies concentrate on the evidence from single sites for example, such as re-fitting studies (Barton 1992), or microwear analysis (Dumont 1988), and may not draw on wider scale distribution patterns. However, for the majority of interpretations of Mesolithic adaptations, and the broad characteristics of the Mesolithic occupation of northern England, the distribution of sites *is* a key element of interpretations.

It is clear from the above discussion that the distribution of sites is a major component of interpretations ranging from changes in population numbers to large scale differences in population densities, the organisation of settlement systems, or activities at a local level, and a continuity of these activities through time. The interpretations put forward about these activities appear to be quite reasonable and logical.

However, any biases which affect these distributions will have far-reaching effects on our interpretations. Unfortunately, many site distributions are substantially biased. Biases affecting the temporal or spatial distributions of sites at different scales not only affect the validity of interpretations based on these distributions alone, but can also affect interpretations based on patterns in the characteristics of sites.

THE EFFECTS OF BIAS

Biases have affected the distributions which form the basis for interpretations of key characteristics of the Mesolithic occupation of northern England in a number of different ways. They can affect the recovery and identification of sites, and also even their interpretation. Similar broad types of biases affect both the temporal and spatial distribution of sites, however certain specific types of biases are unique to either situation and thus temporal and spatial biases are considered in turn.

THE TEMPORAL PATTERNING OF SITES

It is often assumed that known dated sites are a direct reflection of ‘what is out there’ in the archaeological record (or what was deposited in the past), although in reality this is far from being the case.

Different biases affect the recovery and identification of sites in different ways. The effects of different topographic and geological conditions, and different human factors such as the intensity of collection are considered in detail in the following section. These may affect how representative dated sites are of population if, for example, settlement systems changed through time and locations where sites are ‘preferentially recorded’ today were used differently in the past. What is considered here however are those biases which directly affect the relative recovery and identification of sites dated to different periods.

The most obvious bias to have affected the *recovery* of sites dated to different periods is the influence of the stratigraphic location of artefacts. On almost all excavated sites the Early Mesolithic artefacts are recovered from levels beneath the Late. This means that in very simple terms, Early Mesolithic material has a lower chance of being recovered as it is deeper in the sediment (by about 6cm at March Hill, Spikins 1995b, Spikins, Ayestaran and Conneller 1995). This stratigraphic location of different sites might appear to be a minor affect, however it does appear to have a real influence on the numbers of recorded sites by acting *against* the recovery of earlier artefacts - excavations carried out as part of the West Yorkshire Mesolithic Project clearly demonstrated that many flint collectors failed to ‘dig deep enough’ to recover all of Early Mesolithic scatters (Spikins 1994).

Once recovered, sites which are assigned to different periods on the basis of typology may be subject to different probabilities of being correctly *identified*. Differences in the use and form of the main diagnostic element of Mesolithic assemblages - microliths - may markedly affect how sites of either period are recognised. Myers (1986; 1989) notes for example that there is a higher ratio of microliths to other artefact types recovered on Late rather than Early Mesolithic sites (Myers 1986: 235: table 5). The chance of recovering a diagnostic artefact (a microlith) is thus greater in any assemblage of Late Mesolithic artefacts. The fewer microliths likely to be found on Early Mesolithic sites effectively acts *against* these sites being identified in comparison to Late Mesolithic sites. Since most recorded 'sites' are often a collection of only a few artefacts and can't be dated (**figure 2.10**), we would expect, other things being equal, that many more Early rather than Late sites remain unidentified.

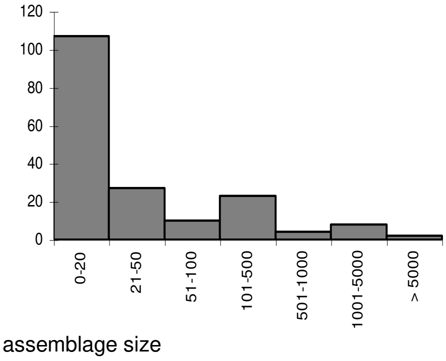


Figure 2.10 Numbers of artefacts on Mesolithic sites in the Pennines (from a database of recorded sites, derived from Sites and Monuments Records for West Yorkshire and Greater Manchester).

There are also factors which act *against* the identification or recovery of Late Mesolithic sites. The tiny dimensions of Late Mesolithic microliths make them more difficult to see than larger Early Mesolithic forms, and the typically dark brown/grey flint or black chert of which they are produced makes them more difficult to distinguish from the peat/soil substrate than Early Mesolithic microliths, which are often made of white flint.

Even if recorded dates were representative of the 'real' pattern of Mesolithic sites, the interpretation of this record may be biased. For one thing, a change in settlement patterns may mean that a supposedly similar 'site' from one period 'meant' something very different in the next period in terms of population numbers. Another factor to consider is the time at which different regions were colonised. One factor that may be affecting Smith's (1992) increase in site numbers may be that some new areas are colonised within the Mesolithic. **Figure 2.11** shows that when dated sites are plotted against Northings, there is distinct differences through time in the area of Britain from which sites are recorded, with most Scottish sites (above about 550000 North) dating to the Late Mesolithic.

Even the way in which information is presented can generate biases. One very simple bias which affects common conceptions is that it is misleading to *directly* compare numbers of sites from the Early to Late Mesolithic to each other. Graphs often compare Early and Late Mesolithic site numbers using equal 'time blocks' (Jacobi 1976 for example). Although the two time periods are often seen as complementary, in fact the Late Mesolithic spans a time period approximately *twice* as long as the Early. This means that differences between the two periods are easily conceptually inflated.

One very different factor uniquely affects the interpretation of radio-carbon dated sites. Radio-carbon dates are not, in fact, a 'true' record of past dates. The sequence of radio-carbon dated sites is in reality affected by variation in the atmospheric content of Carbon^{14}, which makes a direct linear date (the uncalibrated date) only a skewed representation of the 'real' date. Dates *can* be calibrated using the 'radio-carbon calibration curve' to give a date in real years (uncalibrated dates are commonly given the suffix bp or bc and calibrated dates BP or BC) which often gives a very different result from the 'uncalibrated' plot. Thus, a plot of calibrated dates (using CALIB 3.0 - Stuiver and Reimer 1993) (using the central mean where more than one mean date is calculated as the calibrated date) shows a much more complex picture than that of the uncalibrated dates demonstrated in Smith (1992), **figure 2.12**, both for the British Isles as a whole and for northern England.

Although the archaeological evidence for gradual increase in population in the Mesolithic appeared to be clear-cut, a closer consideration of biases has revealed a very different

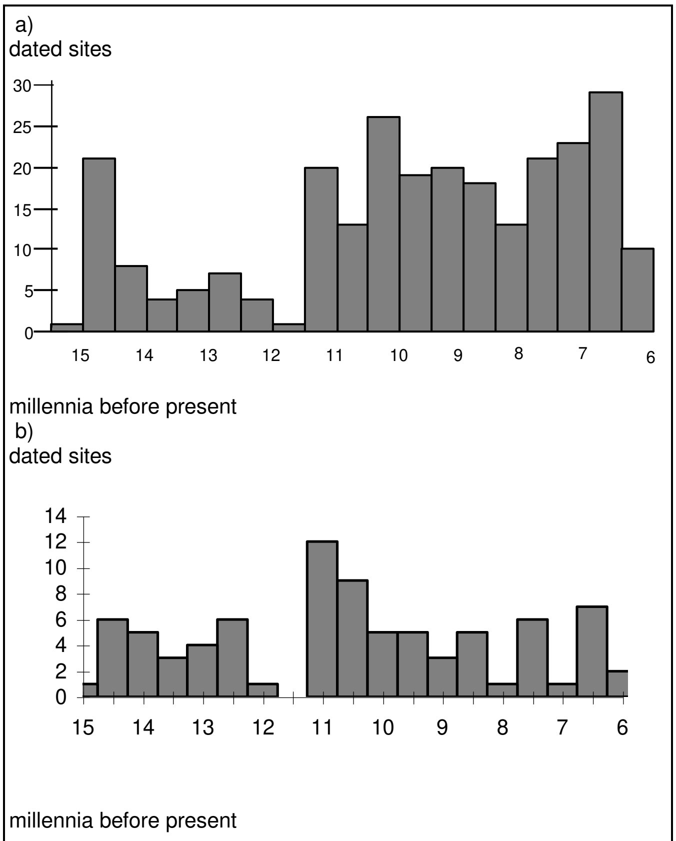


Figure 2.12 Calibrated dates a) for the British Mesolithic and b) for northern England (original dates from Smith 1992).

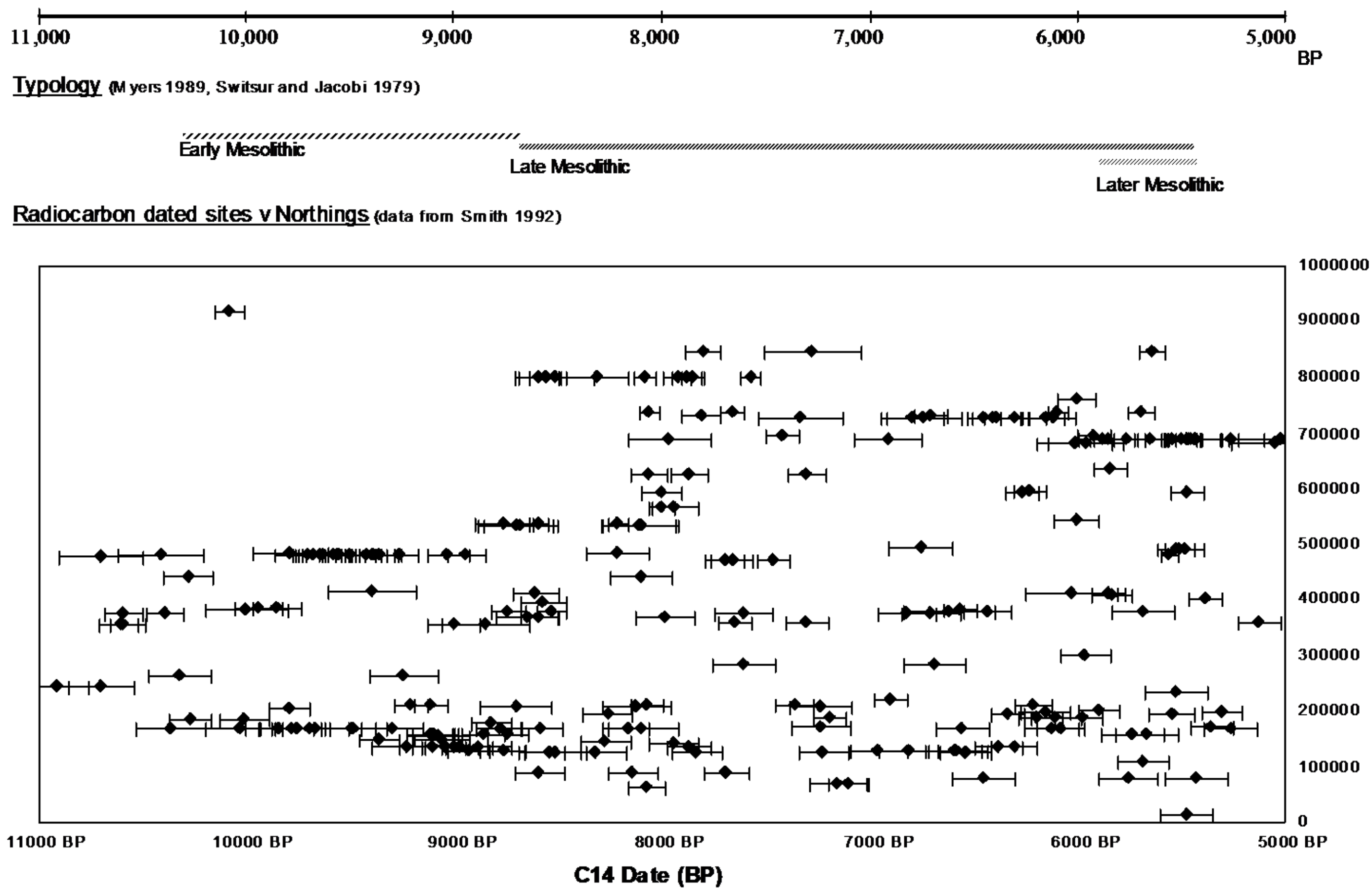


Figure 2.11 Mainland Britain radio-carbon dates v. Northings, with Northern England typology.

picture. There still appears to be an increase in Mesolithic sites assigned to the Early or the Late Mesolithic (according to Jacobi's analysis), but some doubt has been cast of the reliability of evidence for *clear* gradual population increase on the basis of a change in the numbers of dated Mesolithic sites in the British Isles. The picture is evidently a complex one and a better understanding of any possible changes in other adaptations (such as changes in the settlement system or the location of sites) may provide a better context for understanding potential changes in population. Before doing this however, the biases acting on the spatial distribution of the sites must be addressed.

BIASES IN SPATIAL DISTRIBUTIONS

Whilst temporal biases may be straightforward to approach, biases in spatial distributions are rather more difficult to define. As with temporal changes, biases can affect the spatial distribution of sites not only through the *recovery* of artefacts but also their *identification* and *interpretation*. Effectively, the sequence of processes which affect the probability of any 'site' being recorded can be divided into two components - the relative *visibility* of artefacts at the soil surface, and the probability of their subsequent *recovery and recording*.

Visibility

Artefacts are exposed to surface collection and are thus more likely to be recovered where there are natural processes of erosion, ploughing or any other human *disturbances which expose artefact levels* (such as engineering works or road projects). In contrast, they are very unlikely to be recovered where they are deeply submerged such as where sedimentation rates are very high (such as in alluviated river valley bottoms), or in areas which have been inundated by rising sea-levels.

Recovery

Even if artefacts are visible they have a probability of being recovered and recorded, which relates to the number of individuals who pass, collect and record the presence of artefacts. This is essentially related to the *ease of access* to the location, such as the proximity to roads and footpaths, as well as to the presence of *nearby populations* within which some people will be interested in looking for Mesolithic artefacts, and moreover prepared to relate their findings to museums. In many cases this latter factor relates to the presence of local archaeological societies and other similar groups.

The Underlying Distribution?

The two processes of visibility and recovery are often conceived of as a 'window' of opportunity for collection, underneath which is the underlying artefact distribution, whose potential recovery depends on *preservation* (in most of Britain flint or chert artefacts are the main surviving materials from the Mesolithic) and which may be subject to *distortions* due to sediment transport and erosion. The real situation may however be more complex since interpreting this underlying distribution is also far from straightforward, for one thing, the characteristics of the person who finds a 'site' will also influence the *identification* of sites.

TYPES OF BIAS

Different types of biases operate at different scales, and the relation between different factors of bias are often complex and inter-related. We can however broadly define the types of bias and their effects at the three different scales considered.

Natural Variations in Soils and Topography

The natural variations of the landscape - the different geology, topography and superficial deposits of different regions of northern England - have had the most obvious effect at the large scale. These factors include large scale movements of the land surface and sea levels, as well as general patterns of distinctions between different topographic locations and the influence of regional geology and soils.

The simplest explanation for one element of site distributions relates to the effect of isostatic uplift and sea-level change since the last glaciation, considered in chapter one (as discussed by Tooley 1974; 1978; Shennan 1989; Lambeck 1995). The melting of glaciers since the last glaciation caused the volume of water in the oceans to rise and a large part of the evidence for lowland occupation in the Early Mesolithic (about half the total area of the lowland Mesolithic landscape) has been obscured through the effect of rising sea-level. This melting of upland glaciers also removed some of the load on continental areas which subsequently rose, such that the position of the changing coastline is determined by a complex relationship between this 'isostatic recovery', movement of the underlying mantle and sea-level rise. These processes have been modelled in detail by Lambeck (1995). The main axis of present relative uplift (versus down-warping) runs south-west to north-east across the northern part of northern England, with land in the north-west rising and the south-east falling (as illustrated by Goudie and Brunsden 1994: 27, after Shennan 1989). Sites have been submerged by rising relative sea-levels in the south-west and south-east of northern England with coastal sites in the uplifting north-west and north-east remaining visible. Farther north in north-west Scotland, surviving coastal Mesolithic sites provide our main source of evidence for coastal exploitation patterns in Mesolithic Britain (Mellars 1987; Bonsall 1996).

The contrast between uplands and lowlands, through the presence of peat in the uplands, has also had a particularly marked effect on recorded site distributions. The formation of peat is affected by both the geology and the topography of the English uplands. The flat pleateau topography of the Pennines is a major factor encouraging peat formation for example (Taylor 1983). Peat formation is a complex process, which on many of the upland areas of northern England was initiated at different times. Human disturbance has had a major role in the development of peat in water-shedding sites, however in water collecting sites it appears that the change to wetter climates during the Holocene was a major factor causing peat accumulation (Simmons 1996: 133). The precise relationship between human causes (such as vegetation clearances) and natural processes (of progressive water-logging and leaching of upland soils throughout the Holocene) on local histories of peat formation is not agreed upon (Taylor 1983: Simmons 1996). Local variation in the timing of peat formation can in fact be high. At one valley in the North York Moors (North Gill) Simmons (1996: 99) demonstrates that peat formation in the upper section of the valley was initiated during the first half of the ninth millennium bp, in the lower section in the eighth millennium bp with peat spreading to the gentler slopes, and in the middle section during the sixth and fifth millennia bp.

Peat in principle covers and preserves Mesolithic artefacts. However peat erosion, from the last century onwards, has been severe enough to 'cut through' both the peat and the old soil surface (the 'palaeosol') in many areas, in which cases artefacts previously preserved at this buried soil surface become exposed. It is the erosion of peat which has greatly contributed to the much higher densities of recorded Mesolithic sites clearly linked to the upland areas of the Pennines and North York Moors (shown in **figure 2.3**). In fact, although not all uplands are peat covered, and erosion only occurs at specific locations within peat covered areas, the density of known Mesolithic sites above 300m OD is three times the density of sites below this elevation[2].

Peat erosion rates are governed by a number of human factors (discussed in more detail below). Although direct human erosion through trampling at popular footpaths is one factor, high levels of atmospheric pollutants which destroy vegetation (especially sphagnum moss), as well as the intensity of grazing sheep (which both destroy the vegetation cover and physically erode peat itself), have been more influential. Massive upland peat erosion was initiated in the late 19th century largely through a combination of a rise in pollutants and a rise in grazing intensity (Phillips, Yalden and Tallis 1981). The effects of these factors can be considered separately although they are clearly closely related.

Atmospheric pollutants have been a factor of daily life around the heavily industrialised cities at the heartland of the industrial revolution, such as Bradford, Leeds, Manchester and Sheffield, for over a century. The neighbouring uplands have also been affected. Atmospheric pollutants can be either particulate or gaseous. Particulate matter, especially soot, is a major factor influencing rates of peat erosion in uplands in the Central and South Pennines (Johnson and Dunham 1963). Soot, observed in several peat profiles in the South Pennines (Lee 1981), coincides with the disappearance of mosses and peat erosion dated to the middle of the last century (Tallis 1964; 1990). As Nowell (1866) remarked (cited in Lee (1981)), the disappearance of a number of mosses from the Todmorden area correlated with a *'super-abundance of smoke'*. Gaseous pollutants have also had an effect in inhibiting vegetation growth and encouraging peat erosion, and again this pollutants tend to be concentrated in the Central and South Pennines. The North Pennines despite lead

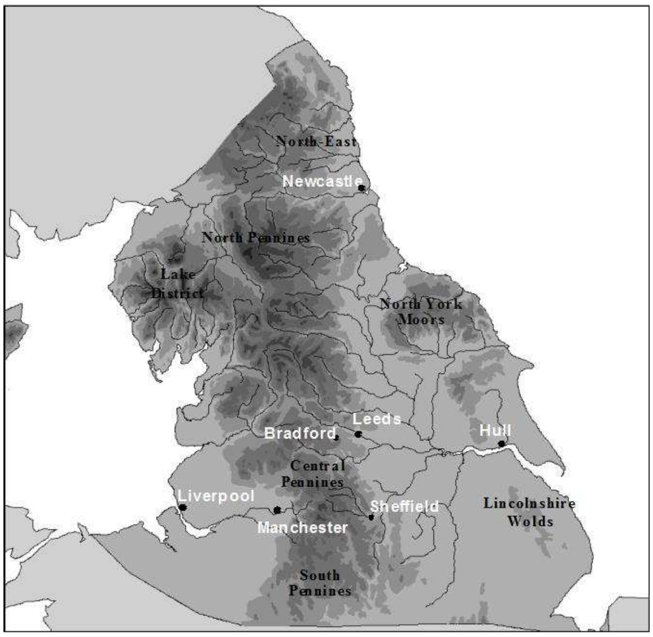


Figure 2.13 Main centres of population in northern England.

pollution (from mining) still have many mosses growing in the peat areas, most probably because they have suffered less from gaseous pollutants (Lee 1981). The co-incidence of the highest density of recorded finds *between* the key industrial cities (**figure 2.13**) may be no accident.

An increase in pollutants in the middle of the last century also coincided with high populations, a demand for meat and a much increased intensity of upland sheep grazing, especially near major industrial towns. Sheep not only directly eat vegetation, but are also effective at trampling sensitive species, and at actively eroding peat haggs when resting. The numbers of sheep on the moors have been increasing rapidly since the middle of last century (see **table 2.1**) and continue to create an erosional problem. Grazing pressures of less than 0.6-0.8 sheep/hectare are necessary for heather and bilberry to survive in appreciable amounts (Yalden 1981), however densities in the Peak District in recent years have typically varied from 1.67-4.54 sheep per hectare (ranging from a minimum of 0.54 to a maximum of 8.12), (Phillips 1981) with even higher effective densities where much of the vegetation (such as matt grass) is now unpalatable to sheep (Evans 1992: 55).

Almost all upland moorlands have suffered the effects of over-grazing and consequent peat erosion. Young (1986) notes that the main factor influencing recovery in the North Pennine uplands, like those to the south is also peat erosion.

	1805 (Luccock 1805)	1874 (MAFF 1874)	1973 (MAFF 1973)
North Riding	365.3	731.5	880.8
West Riding	383.1	770.6	896.0

Table 2.1 Numbers (thousands) of sheep in the North and West Riding of Yorkshire (after Evans 1992).

[2] In the database derived from Wymer (1977) considered here, there were a total of 647 find locations above the 300m contour and 1,340 below it. The total area of the former was 6,179km^2 and the latter 41,140km^2 (as recorded in ArcInfo from the digitised topography), giving a density of 0.0325 finds per km^2 in the lowlands and 0.090 finds per km^2 in the uplands. The figures are meant only to illustrate the relative densities, not as precise measures of finds densities in the two environments.

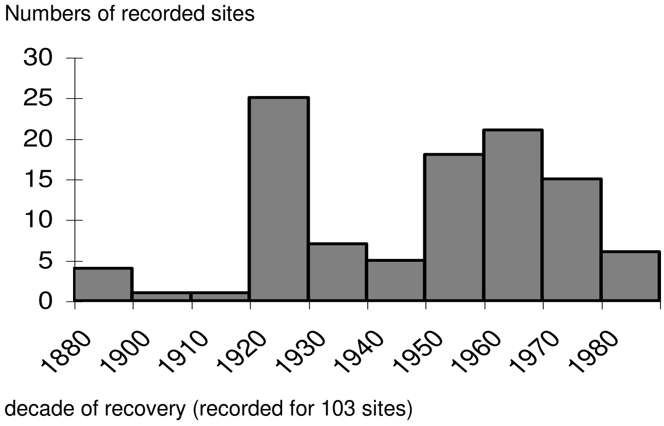


Figure 2.14 Numbers of recorded sites by decade in the Central Pennines.

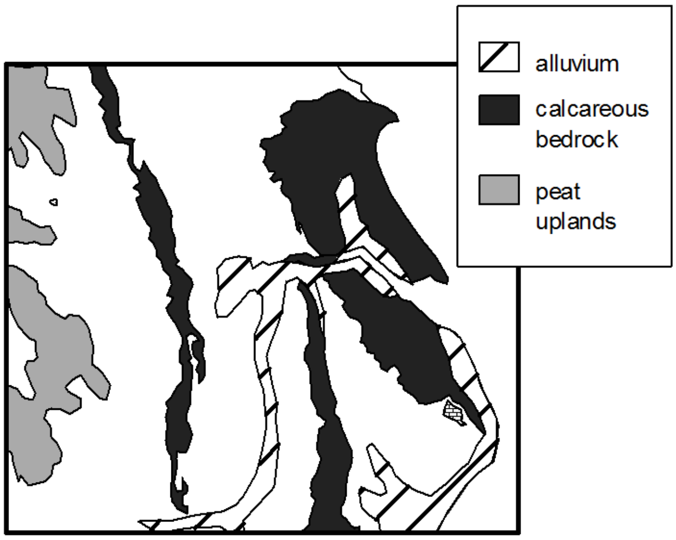


Figure 2.15 Deposits affecting the visibility of sites in south-east northern England.

The initiation and continuation of flint collection activities, the *recovery* of artefacts, made visible through erosion, although linked to the antiquarian tradition, appears to be closely related to the subsequent initiation and severity of peat erosion. Dates of finds collection from the Central Pennines thus begin when peat erosion is first initiated and continue to the present (**figure 2.14**) (the effect of the second world war in removing flint collectors 'from the scene' is also clear in this figure).

The area chosen for the local scale study, Marsden moor, was once severely eroded although it now suffers from only limited erosion (thanks to reduced sheep numbers under the ownership of the National Trust). Photographs from the 1940s to 1960s document a high level of erosion, and a level of collection which followed suite (aided by the ease of access to this site, a factor discussed below). A local collector, J. L. Turner (1964) noted in the 1960s

March Hill, the mecca of all true flint addicts... this place is in absolute turmoil being slashed, hacked and torn to pieces in a most sacreligious way. Ammon Wrigley [a local historian]*would surely turn in his grave could he but see, the terrible way in which March Hill has been cut to pieces.*

The distribution of peat and peat erosion are not the 'whole story' of site distributions. Most other effects of natural physical variations are however much more specific to particular regions. One that is particularly important in the context of interpretations of settlement systems (Jacobi 1973; 1978) is the marked contrasts in recovery conditions from the Pennines to the Yorkshire and Lincolnshire Wolds, across the floodplain of the Humber estuary.

A consideration of the deposits (**figure 2.15**) in this area suggests that a number of factors may be 'inflating' the densities of sites at either end of Jacobi's (1973; 1978) settlement system, whilst at the same time the densities of sites in the 'middle' of the proposed settlement system may be artificially reduced.

In terms of the two ends of the 'settlement system' it is already clear, as noted above, that sites in the peat uplands are exposed by erosion. However, two factors may also be encouraging the recovery of sites in the Lincolnshire Wolds. Both these factors relate to the local predominance of calcareous bedrock - in the case of the Wolds, soft chalk soils. First, these soils are particularly prone to erosion. Evans (1977: 58) for example demonstrates values of 90-200mm per year of total lowering through recent erosion of chalk substrates. Secondly, the chalk soils are a major source of flint, and regions closer to a flint supply might be expected to yield a greater density of artefacts. In simple terms, where flint is in short supply, artefacts are re-used more intensively (so fewer enter the archaeological record) are smaller (and more difficult to find) and also other material may be used rather than flint where this is possible.

The effect of flint availability in the past on present finds densities can be illustrated by recent regional surveys of lithic scatters. One example of a fieldwalking survey carried out in an area which had no local flint sources was that in the Tyne-Solway valley in the north-east of England, conducted by Tolan-Smith (1996). An example of a survey carried out in a similar environment where flint sources are local could be a survey in Hampshire carried out by Shennan (1985: 50). It is very difficult to compare data from fieldwalking projects, since recovery rates depend on many different factors (such as the depth of finds, type of ploughing experience of collectors). Comparisons may not be accurate, however the contrasts between the two surveys are nonetheless remarkable. In the former, collected finds densities are about 0.97 items per 1000m^2 (Tolan-Smith 1996: 9), in the later on the other hand, finds densities reached an average of 79.5 artefacts per 1000m^2 (Shennan 1985: 50). Though incidental to the main discussion here, this lack of local sources in this north-east region may be one factor effecting the relatively paucity of sites in these areas (clear from **figure 2.3**), and at least making it very difficult to separate potential differences in past population densities from biasing factors.

One major factor acts against the recovery of sites in the intermediate zone of Jochim's (1973; 1978) settlement system. This is the large deposits of alluvium which have started to accumulate since the Mesolithic (Jones 1993: 257). The accumulation of alluvium would effectively obscure sites beneath a dense layer of silt, preserving sites at a deeper level than ploughing or construction activities typically disturb.

Essentially, whilst sites in the Pennines and in the Lincolnshire Wolds in the Early Mesolithic *may* be linked by raw material and artefact similarities, there is little real evidence that they formed either 'end' of a settlement system. At the least, many other sites which have yet to be recovered may also have been part of a wider regional pattern.

Different geology and soil types also affect other regional patterns. Myers (*pers. comm.*) notes for example a relative increase in the densities of sites on limestone areas in Derbyshire, where thin soils make the chances of recovery easier. The same process has also been noted at Malham Tarn (Donahue 1996), particularly where finds are easily brought to the surface by mole action.

The types of flint that are found in different deposits, different chalk regions, or different local river gravels, may even have had an effect on the distribution of different categories of sites. The nature of the raw material used when knapping flint tools can have a major effect on the end product - small flint nodules restrict the user to the production of small flakes and blades for example, while certain types of flint and chert can be used to make finer blades. Although in Europe evidence has been found for stylistic traits that cannot be linked to raw material constraints (the right and left lateralisation of microliths, Gendel 1984; 1987), it is certainly possible for the style zones identified by Jacobi (1979) to be at least influenced by raw material source areas. It may be 'suspicious' that the *Midlands/East Anglian type* assemblages relate to the area of use of Wolds flint in the Late Mesolithic, and the *northern straight-backed bladelet type assemblages* or *March Hill industries* to the use area of local valley gravel flints. How accurately the 'style' of artefacts types represents past social groups is another issue (Hodder 1982). Further work on these assemblages would however be needed to test this suspicion.

Unique geology and soil conditions can have effects at the local scale. One factor which may be influencing the differences in local densities of recorded sites along the Northumberland and Durham coast in the north-east for example, is that sand dunes north of the river Tees (shown in Goudie and Brunsden 1994: 45) would both offer more opportunities for access to the coast in the past, and for the exposure of artefacts in the present than the predominance of cliffs to the south of the Tees (Goudie and Brunsden 1994: 50).

As noted above, many distributions are the result of complex interplay of different biasing factors. Natural landscape variations are found at different scales, with these processes combing with 'human' factors to affect site recovery, whilst other 'human' factors to affect the identification of sites. In particular 'human' factors of bias are evident at all scales, but the effects are clearest at the medium scale.

Human Factors

Human factors influencing site distributions include broad biases resulting from patterns of human exploitation of natural landscapes, different land use practices and variable population densities, as well as more 'individual' human factors such as the influence of particular individuals on the record of sites.

Different land-use practices can have a marked effect on the *visibility* of sites. The influence of grazing pressures causing erosion within peat uplands has already been noted. In the lowlands, the main factor affecting finds recovery is ploughing. Ploughing on arable farms only reveals only a limited number of artefacts at the surface which are only occasionally recovered and reported. Schofield (1991: 101) carried out experiments which suggest that the maximum recovery of surface assemblages is only 3.5% of the actual ploughzone assemblage (this figure is for flakes and tools, a figure of 0.5% being taken as a maximum for cores), these precise numbers of artefacts of course depending on the depth of artefacts, and of ploughing as well as other factors such as the substrate. Nonetheless, though only an element of total artefacts are revealed, the effects of ploughing in heightening the visibility of artefacts is clear. For the sites in the Central Pennines (listed in Appendix A), where the method of discovery was stated (only 76 sites), 61 were recovered due to erosion (almost exclusively of upland peat as previously disussed), 10 from ploughed fields, and only five from other causes - 2 from quarrying/gravel works and 3 from forestry work. The effects of ploughing are also one of the main influences on the recovery of sites in Weardale (Young 1986; 1987).

Whilst differing intensities of upland sheep grazing, and lowland arable farming, have a local effect, they can however also have a wider effect at the regional scale, and an effect which may be relevant to the issue of distinct upland and lowland patterns of activity. Whilst it is often considered that, in simple terms, upland peat areas are the preserve of hill sheep farming, with lowland areas being the preserve of *both* arable and livestock farms, this is not strictly the case. Sheep farming is in fact the dominant land-use not only on peat uplands, but also on the lower flanks of these uplands, down to flat lowland areas (Evans 1992). Essentially whilst artefacts in peat covered areas may be relatively more 'visible' than in the intermediate zone due to peat erosion, those in lowland areas may be more 'visible' than in the intermediate zone due to arable farming and ploughing. Evans (1992: 56) for example states that *'between the slopes* [of peat covered uplands] *which are susceptible to overgrazing and the arable fields is a zone of (now improved) grassland where erosion is rare'*. In effect, it is possible that the supposed evidence for a distinct division between upland and lowland sites may be more a factor of modern land-use practices than any distinction in the past intensity of activities.

Differences in land-use practices might also explain national scale contrasts in apparent site densities. Arable farming is more common in the south and east of Britain, and 'rural' population densities are also higher (a factor discussed below), with livestock a more common land-use in the north and west of England as a whole. Smith and Openshaw's

(1990) two zones of population, in the north and south (with the later including the area around the Humber estuary), might thus be a factor of land-use practices rather than Mesolithic occupation densities. Detailed analysis may be necessary however to determine if this is the case.

Another land-use effect, which in this case affects the *recovery* (rather than the visibility) of sites, is the densities of people living near any area. Human populations provide a reservoir of potential collectors, who might find and record sites and relay this information to sites and monuments records or publications. Actually most ‘flint collectors’ are ‘country folk’, however the densities of populations in ‘rural’ areas are much higher near large cities, providing another potential explanation for the high densities of sites recovered in the Central and South Pennines. Population densities also affect the numbers of sites recovered through professional archaeological studies, as many of these are carried out in advance of development work, which tends to concentrate in big cities. On the other hand, the construction of these cities themselves has often obliterated any evidence for Mesolithic sites. Young (1986: 218-224) cites the influence of a lack sites around Sunderland as an example of this process.

The influence of nearby populations is very variable at a local scale. First, because of the effect of access routes, roads and footpaths. Sites on Rombalds moor, for example, are concentrated along the main brow of the moor following the footpath. Secondly, because of the ‘individual’ factor. Certain individual flint collectors (or even professional archaeologists) can have a marked effect on site distributions. Young (1986: 218-224) notes that in Weardale sites are particularly concentrated near the home of one important collector (E. J. W. Hildyard), and Young and O'Sullivan illustrate the effect of several collectors on the distribution of sites in the North East of England (Young and O'Sullivan 1993). In the Pennines the influence of several key collectors, have had a clear effect, with sites excavated by Francis Buckley in the 1920s being concentrated near his home town of Marsden, for example.

The effects of individuals on site distributions are often more complex than they might at first appear. For one thing the numbers of sites in any area will be affected by what any individual chooses to term a ‘site’. Most sites in the Pennines are actually collections of a very small number of artefacts, often even single artefacts picked up in an *ad hoc* manner on a ‘Sunday afternoon stroll’ (**figure 2.10**). One individual might consider that each collection ‘event’ has recovered a ‘site’, whilst another might collect from the same ‘site’ for many years (Yarwood and Marriott 1994). Standards of accuracy in the location of sites are also very variable (Yarwood and Marriott 1994). Aside from the different densities of ‘sites’ which different methods of collection (and of erosion) might produce it is also very difficult to relate so-called ‘sites’ to real patterns of past activity. Excavations and test-pitting and auger surveys on Marsden moor have revealed that artefact distributions can be more or less continuous over a large area (about 250m^2 in the case of March Hill Carr) and relate not to one but to many overlapping phases of occupation.

Clearly, although the composition and character of upland sites, if not their distribution, is often considered to be free from bias, the effect of different individuals, and of the unique character of upland excavations, *can* affect both the character and composition of upland assemblages.

Several authors note the typically ‘small’ size of recorded upland sites. Both Mellars (1976) and Myers (1986; 1987) for example have drawn upon the small spatial extent of upland ‘sites’ in their interpretations. However there are several reasons why upland sites in contrast to their lowland counterparts may have been recorded as relatively ‘small’. One immediately noticeable characteristic of upland excavations is that they tend to be ‘incomplete’ (Stonehouse 1990: 62), in the sense that artefact distributions continue beyond the area excavated (demonstrated for old excavations re-excavated in the Pennines, Spikins 1994). As noted above, the real distribution of artefacts in upland sites, albeit being many phases of activity, can be large. The extent of a ‘site’ is therefore largely a measure of the available time, difficulty of excavation and determination of the collector. In the Pennines two general factors may be acting to limit excavated site size. First, the nature of the overlying sediment can affect site ‘size’, since sites tend to be excavated at the edge of the peat margin (where artefacts are exposed) here peat depths increase rapidly away from the marginal face (by as much as 10cm per metre) making excavation increasingly time consuming. Secondly, wet, windy and misty weather conditions in the uplands are a major deterrent to prolonged excavation.

Upland weather conditions combined with the ‘human factor’ may also affect site characteristics in other ways. The potential for noting and recording features in perpetual drizzle is low. In fact, a weatherproof covering was found to be essential to ensure adequate finds recovery when excavating sites on Marsden moor. Whilst features are traditionally rare on Pennine upland sites, under covered excavations an average of one feature every 5m^2 excavated was recorded (including five hearths, a stakehole and an undiagnosed feature). It is hence no surprise to discover that recorded upland sites are smaller in size and contain fewer features than lowland sites. Essentially, these characteristics may be more to do with the nature of upland excavation than with any contrasts in the types of upland and lowland activities in the past.

The ‘human factor’ can also affect the recorded composition of assemblages. Almost all the sites which can be typologically dated, and almost all of the sites with identified microliths in the Pennine dataset studied here, for example, are clustered around Marsden moor. This is largely because of the care and attention paid by local flint collectors and amateur archaeologists, from Francis Buckley to more recently Pat Stonehouse, and their ability to identify and record different artefact types and to pass this information on to the official SMR record.

Museum collections from actual excavations appear to be the best evidence available for variations in assemblage composition (and form the basis of the analyses by Jacobi 1976, Mellars 1976 and Myers 1986) but these may also be very biased. Francis Buckley, whose collections form the bulk of these analyses, commonly selected the 'best pieces' from any assemblage to send to different museums, before leaving the remainder as the main record of the sites in local museums. Since no regional analysis of recently excavated assemblages has been carried out, interpretations are thus heavily dependent on the biased records of museum assemblages.

Clearly the relationship between human and natural biases is complex and interrelated. It is not possible to 'factor out' different biases both because they are interdependant, and because such detailed information (such on how frequently footpaths were used) would be needed. However, it may be possible to get closer to accounting for biases at a local scale, where it is possible to collect detailed information. Discussions at this scale are particularly important, since the common preferences of 'sites' recorded at this scale have been taken to imply a long term continuity of upland hunting activities and of Mesolithic populations. A detailed study of the biases affecting 'sites' at this scale, on Marsden moor, has been carried out through West Yorkshire Mesolithic Project (Spikins 1996), the results of which are discussed below.

Figure 2.16 West Yorkshire Mesolithic Project - excavations on Marsden Moor.

MARSDEN MOOR - A DETAILED STUDY.

Marsden moor (**figure 2.16**, and distribution of sites, **figures 2.7** and **2.8**) has been a key area in discussions about the landscape 'preferences' of Mesolithic sites, and is often used as an illustration of these preferences (such as Simmons 1996: 34). One element of the research carried out by out West Yorkshire Mesolithic Project (Spikins 1994; 1995b; 1996) has been a detailed study of vegetation and erosion patterns in this area. This study was carried out in order to address the importance of biasing factors affecting the surface recovery of Mesolithic material, and to provide information for future management of the moor.

Marsden moor has a long history in Mesolithic research. It has been subject to the attention of collectors and archaeologists since the 1880s. The 'sites' of March Hill, March Hill Carr, Dan Clough, Lominot and Dean Clough are all clustered together, at the narrowest part of the Pennine watershed. Law and Horsfall were the first to mention March Hill, having collected artefacts from this moor in 1879 (Law and Horsfall 1882). Later, the work of Francis Buckley in the area in the 1920s was of major importance to the wider discipline (Buckley 1924 and unpubl.). Buckley was instrumental in the discovery of two phases of the Mesolithic (the Early and Late Mesolithic) which he termed the '*Broad Blade*' and '*Narrow Blade*' industries respectively. The importance of his excavations at Marsden moor are cited by Petch (1924), Clark (1932), Radley and Mellars (1964) and Jacobi (1976). Radiocarbon dates taken from Buckley's excavations have also been influential in the dating of the British Mesolithic (Switsur and Jacobi 1975; 1979) with four of the eleven sites dated being from Buckley's sites in this area. The whole area was intensively 'scoured' by collectors in the 1960s (Turner 1964, cited above). March Hill, Dan Clough, Dean Clough and Lominot are also key sites in local publications such as Barnes (1982), Williams (1985), Stonehouse (1987; 1990), as well as national research syntheses and assemblage analyses such as Jacobi (1973; 1976) Mellars (1976) and Myers (1986; 1987). The most recent references include Smith (1990) and Simmons (1996). The area has also been researched as part of the West Yorkshire Mesolithic Project with four field seasons running from 1993 to 1996. Given the intensity of collection at these sites, it is a reasonable assumption that biases on the visibility of sites are the main recent factor influencing recorded site distributions, making this area a particularly interesting area to study. Here at least there may be potential for accounting for the main factors of erosion which have biased site distributions.

Marsden moor is typical of an upland Pennine landscape. The main body of the peat plateau is covered with vegetation characteristic of upland peat areas - wavy hair grass and cotton-grass, with matt grass in drier areas. The hill slopes are dominated by matt grass and moor rush lines stream beds. The peat areas themselves are eroded across the plateau and at the edges of the peat face, and streams running east-west have also cut steep sided valleys and in some areas steep scree slopes. Modern human influence is clearly felt as the moor is crossed by a main road, the A640 which runs from Huddersfield to Manchester, and is criss-crossed by a number of footpaths, including the Pennine way (none of which coincides with the distributions of recorded sites). It is also a popular spot for tourists, especially since it is near to a viewpoint to the north on Cupwith Hill and because of the pub overlooking March Hill from the north, Buckstone's Inn.

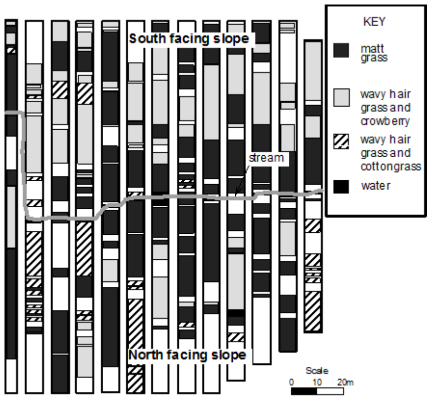
At first inspection, the pattern of erosion in this area appears to confirm that the locations of sites represent real 'preferences' on the part of Mesolithic populations. As noted by Spikins (1993; 1995c) most sites have been recovered from locations with quite limited erosion, that is, the south-facing slopes at about 420m OD elevation. Erosion is much more extensive both at higher elevations (on the Pennine watershed) and on north-facing slopes which suffer from severe frost action (as they are colder, receiving less warmth from the sun).

However, different *types* of erosion tend to occur in different conditions of altitude, slope, vegetation cover, and rainfall. The two most important types of peat erosion are *dissection systems* and *marginal face erosion* (Bower 1960).

The main type of erosion on the peat plateau, both at Marsden moor and more widely in the Pennines, are *dissection systems* (often termed Type I erosion). These tend to be present at the highest elevations. Erosion breaks up the peat body into haggs and groughs (termed reticulate erosion), which can also include a branched network of gullies on sloping ground. Dissection systems are familiar for example to walkers over Bleaklow in the South Pennines. This type of erosion does not necessarily reach the peat base but may in cases be restricted by a denser layer of peat at the base of the peat profile.

At the edge of the peat plateau, where a gentle peat covered slope suddenly steepens *marginal face erosion* occurs (Johnson 1957). This is the type of erosion shown at the edge of the peat face on the north and south-facing slopes of Dean Clough as well as the north and south facing slopes of Dan Clough and March Hill. In deep peat on gently sloping ground (steeper than 3-5°), steep-sided unbranched gullies can extend back from this peat margin for a few hundred metres (termed Type II erosion). Alternatively *arcuate scars* (with near vertical back walls on slopes steeper than 10°) can also develop. These latter types of erosion are often termed 'sheep scars' and are likely to be the result of sheep action (Yalden 1981).

A detailed survey of vegetation and erosion patterns across the valley of Dean Clough, and further surveys across the main peat plateau, at first confirmed the patterns noted above, with the densest concentrations of sites being found where erosion was limited, with few sites found where there was extensive erosion. However the explanations for this patterning were complex, as discussed below.



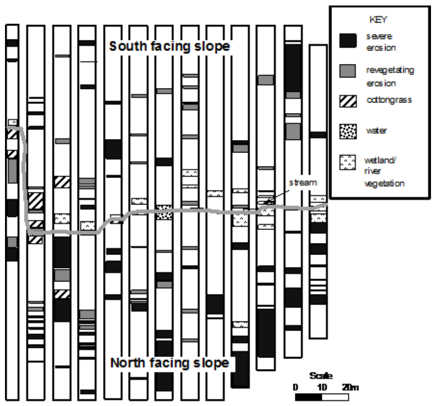


Figure 2.17 Vegetation Survey, main vegetation types. **2.18** Vegetation Survey, types of erosion.

Figure 2.19 North-facing slope of Dean Clough.

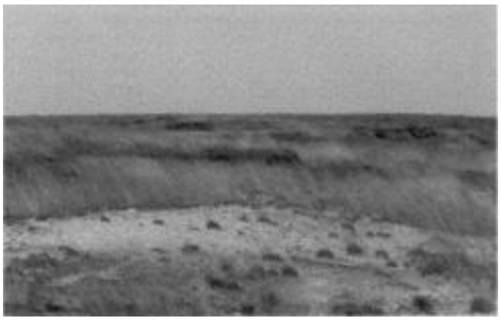


Figure 2.20 Central Plateau.

Figure 2.21 South-facing slope of Dean Clough.

A Detailed Survey

Vegetation on Dean Clough was recorded according to 30 different categories of plant communities, in north-south vegetation transects spaced at 20m intervals. The area covered was approximately 260m along the valley and 300m across the gradient. **Figures 2.17** and **2.18** show a summary of the results of this vegetation survey with vegetation types plotted in 'on the ground' distances. The stream marked is Readycon Dene stream, and shows a clear association with the wetland vegetation. The survey results also show the typical concentration of matt grass on the steeper slopes of the valley sides (**figure 2.17**), and wavy hair grass and cotton-grass (marked as 'short grass', or with crowberry as 'crowberry') on the main body of peat. Matt grass also extends onto and above the marginal peat face, a reflection of the extent of grazing (matt grass is resistant to grazing by sheep).

Erosion in this area is concentrated in two locations, the higher parts of the peat plateau (studied in a different survey), illustrated in **figure 2.20** and the marginal peat face within the valley, **figure 2.19** and **2.21**. The survey revealed a distinct contrast between the north and south-facing slopes that is typical of Pennine valley systems (which predominantly run west-east).

On the north-facing slope the greatest extent of 'severe erosion' is recorded. This is largely because this slope receives the least warmth from the sun and the surface is subject to intense frost action, especially over the winter months. In these areas the marginal peat face erosion is continuous with deep linear groughs along lines of streams and water movement from the peat plateau (Type II erosion), **figure 2.19**. The eroded peat extends to the plateau beyond (visible in **figure 2.20**) which is also heavily eroded (Type I erosion).

On the south-facing slope, there are more small patches of 'regenerating erosion' (i.e. where vegetative growth is apparent), **figure 2.18**. This is where marginal sheep scars have exposed a flat area at the mineral soil level (rather than extending further into the sandstone) and this matrix provides better nutrients for vegetation, as well as receiving more sunlight, than the exposed peat of the north-facing slopes. This re-vegetation can be seen clearly on **figure 2.21** (showing the original exposed area which has also been subject to damage from collectors). Crowberry survives here with purple moor grass and cotton-grass on the drier edges of the sheep scars (see **figure 2.17**). Crowberry is replaced by wavy hair grass and cotton-grass, without crowberry, on the north-facing slope.

It is possible to determine the level of Mesolithic artefacts within the peat profile quite accurately. GIS-based models of the three-dimensional artefact location according to the stratigraphy demonstrate a clear clustering of artefact locations at the mineral soil - peat interface (Spikins 1994; Spikins, Ayestaran and Conneller 1995). The effect of different erosion types, which occur in different topographic situations, on exposing this level are summarised below, with reference to **figure 2.22**.

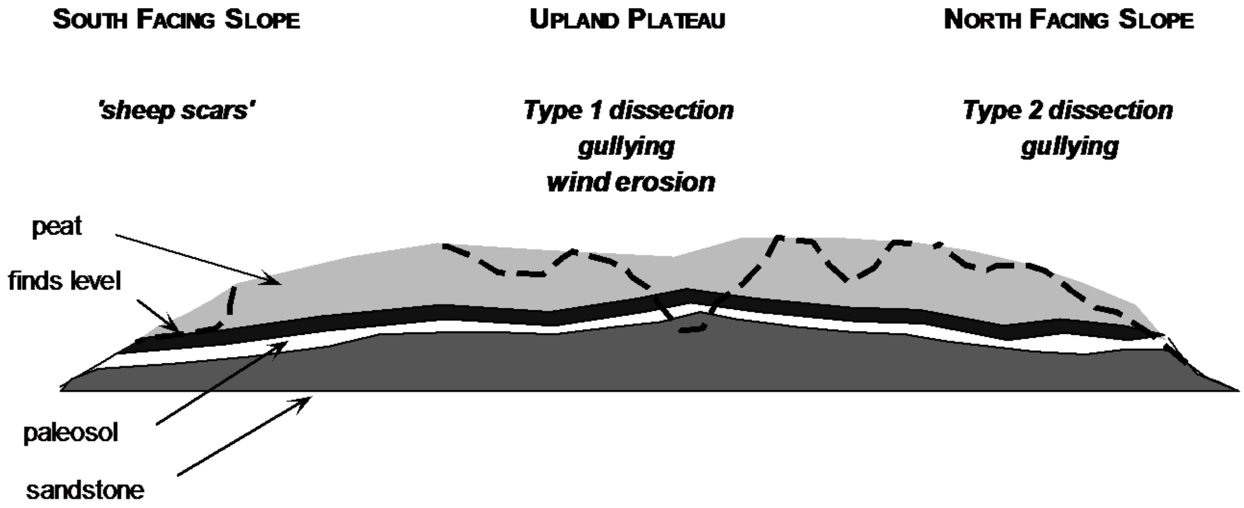


Figure 2.22 Model of Erosion types.

The Influence of Erosion Type on Finds Recovery

On *north-facing slopes* erosion is severe due to frost action, and with subsequent gullying (Type I erosion), mineral soil can be exposed. Artefacts may be recovered in a narrow broken band at the marginal peat face, although the extent of surrounding eroded peat and its fluidity means that exposed mineral soil is often re-covered by a re-deposited peat layer (see **figure 2.19**).

On the *central plateau* peat can reach depths of up to 8m. Thus even when extensive, plateau peat erosion does not necessarily extend to the finds level. Severe erosion (Type II), especially in areas which have suffered the effects of moorland fires, can reach the artefact level and quite frequently extends horizontally exposing large areas of sandstone matrix with steep sided gullies (see **figure 2.20**). Whilst finds *are* exposed in these situations it is difficult to recover artefacts since the small size of most artefacts, especially diagnostic elements such as microliths (often only about 1cm long) makes them difficult to separate from eroded sandstone.

On *south-facing slopes* erosion is less severe, however the main agent of erosion in these locations is sheep. Sheep prefer to graze and ruminate on warmer south-facing slopes. They encourage erosion, not only by trampling and by consuming vegetation, but also by sheltering in breaks in vegetation at the marginal peat face. The action of sheep (in creating so called ‘sheep scars’) is particularly important since it exposes a large area of mineral soil *at the finds level* (see **figure 2.21**), and since sheep instinctively prefer to have a clear view of their surroundings, these locations also tend to have a ‘good view’.

Evans describes the action of sheep in creasing ‘sheepscars’ in detail.

Sheepscars are formed which comprise a backwall and scar apron (Evans 1977). The backwall continually retreats because sheep rub themselves on it or it is broken down by their hooves, whilst the apron extends because the sheep disturb the surface and frost, wind and rain act upon it. Stones are kicked away downslope from the apron onto the grass so covering and killing it. In places large areas of thin soil are being stripped from the underlying weathered rock

Evans (1992: 54)

The effects of sheepscars in eroding peat and exposing finds might at first seem minor. Sheepscars are not the most visible types of erosion, particularly because this type of erosion exposes mineral soil, which re-vegetates quickly, rather than exposing large areas of damp dark peat. However, the total area of sheepscars in any location can be large. Evans (1977) attempted to classify the specific causes of soil erosion in a specific valley, Hey Clough, South Yorkshire, concluding that sheepscars created 35% of the total erosion, with some single scars reaching sizes of 20-30m^2 in area.

A closer consideration of the effect of erosion in exposing artefact levels reveals several important patterns. We would expect the most severe erosion to be at valley heads at pollutants concentrate in these areas (Lee 1981). However, it is also clear from the above discussion that the visibility of artefacts is not greatest at highest elevations where peat erosion is most severe, as had been assumed, but is instead greatest at lower elevations (about 420m OD) at the marginal peat face. Furthermore, artefacts are also most visible on south rather than north-facing slopes.

Effectively, the optimal recovery locations for sites, according to erosion patterns should be ***at pleateau edges, on south-facing slopes, especially at valley heads,*** and ***in locations with a wide area of view***. These are exactly the types of location interpreted as relating to Mesolithic ‘preferences’ by Radley and Marshall (1963: 96), Jacobi (1976; 1978: 32), Barnes (1982: 25), Spikins (1993; 1995c), Simmons (1996: 33-4) and Kvamme and Jochim (1985). Moreover, further confirmation that the locations of sites are largely a reflection of the location of the marginal peat face have been revealed at Marsden moor, where recorded ‘sites’ have been related to *past* marginal peat face erosion patterns (through contour surveys and surveys of vegetation

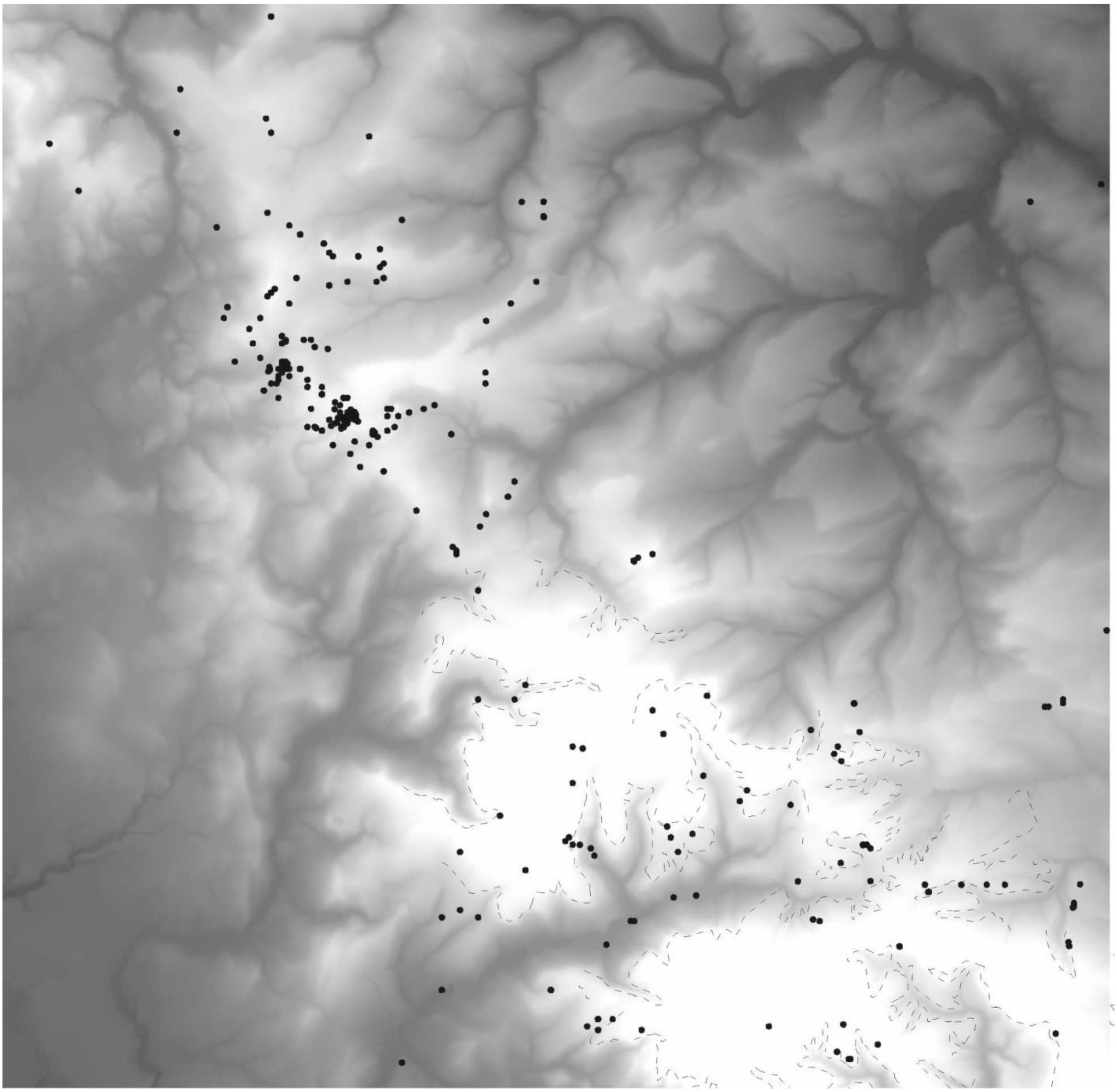


Figure 2.23 Recorded marginal peat face erosion in the southern Pennines and the distribution of recorded sites.

characteristic of previously eroded areas) even where presently the locations of these sites are not eroding. (Spikins 1995b; 1996).

The influence of differential erosion on site distributions at the local scale, has far-reaching implications. At the local scale itself, there *may* be more sites located on south-facing slopes at around 420m OD, where there is a good view, in fact this preference would not be an unreasonable one to expect from hunter-gatherers. However, there is no evidence that these *were* the preferred spots, nor, more significantly, that the same spots were preferred for millennia.

At the regional scale, the biases towards a specific elevation also suggest that, not only is there a marked distinction between upland and lowland sites which is quite probably a result of differential erosion, but moreover that the lack of upland sites above this elevation may also be a result of different erosion patterns. The location of the marginal peat face in the South Pennines (Phillips, Yalden and Tallis 1981), **figure 2.23 ,** for example, suggests that this type of erosion is a more important influence on distribution than severe erosion (**figure 2.6**). Using the elevation of the known marginal peat face in the Southern Pennines a rough idea of the location of this marginal face in the Central Pennines, where the main densities of sites have been found, can be mapped, **figure 2.24** (using here one standard deviation of the variation in elevation of the marginal peat face above and below the average i.e. 453m ±48m). This also appears to correspond to the limits of the site distribution.

That the 'lack' of sites at the highest elevations could be a result of differential erosion patterns should come as no surprise. It has already been suggested that erosion may be creating false patterns in site distributions, and that sites may be hidden in certain upland areas (Raistrick 1932; Garton 1987). Moreover, from an ecological perspective, there is no particular reason to assume that Mesolithic populations were constrained to low uplands. In the Alps, apparent long-term 'domestic' occupation sites, where children's teeth have been recovered, have been found at elevations as high as 1,900-2,300m in the PreBoreal (Broglio 1996: 42). Given the biases from differential erosion operating at high elevations, and those from different land-use practices in the mid-uplands, there is little evidence for a distinction between upland and lowland sites on the basis of site distributions.

There are also implications for broader ideas about adaptations. Given the patterns outlined above, it appears that a narrow 'window' of increased artefact visibility and preferential recovery could exist in many upland regions (where sheep are a major agent of erosion of peat covered areas). The distribution of sites on Marsden moor, and in other areas, is thus a 'false pattern' if we are looking to interpret human activity. Considering the effects of biases thus casts doubt on interpretations of upland hunting, and of a continuity of landscape use between the Early and Late Mesolithic or between the Late Mesolithic and Neolithic which depend on the basis of sites clustering or common 'preferences'.

From the large scale, to the medium scale, to the small scale, the effect of biases has been found to be much more pervasive than was at first assumed. There initially appeared to be several clear patterns in the temporal and spatial distribution of sites in northern England, which might provide a means of 'building up' a model of Mesolithic adaptations, on the basis of the archaeological evidence for population and settlement. Patterns included clear increases in the numbers of sites, and by implication in population numbers, through time, which tied in with changes in the apparent settlement systems of different hunter-gatherer groups. There also appeared to be evidence for broad distinctions between different social groups at the national scale, for specific settlement systems at a regional scale, as well as for distinct upland and lowland patterns of activity, and at the local scale for a continuity of use of the uplands.

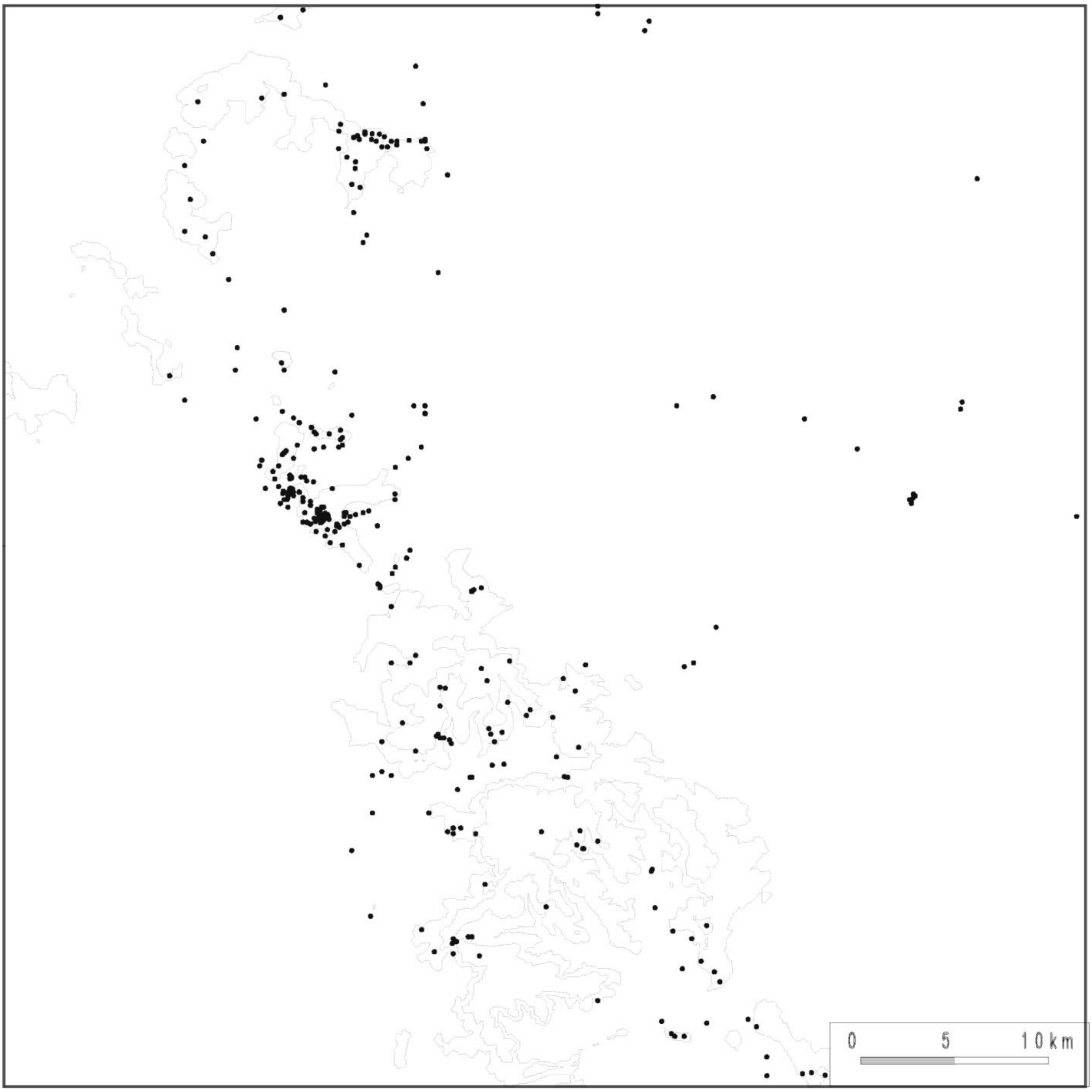


Figure 2.24 Model of marginal face erosion in the Pennines and the distribution of recorded sites.

Many of these interpretations have been seen to be built on ‘shaky ground’. Interpretations relying dominantly on the distributions of sites are seriously affected by biases introduced from variations in the natural physical landscape, as well as from the ‘human factor’. However, even patterns in the composition or character of different sites are affected by biases, introduced by the character of an individual collector or excavator as well as by the characteristics of upland environments. Other types of bias, which also affect interpretations, such as common preconceptions about the structure of settlement systems, are considered in a later chapter dealing with methods of interpretation (chapter four). It is already clear here however that the effects of biases make a ‘top-down’ approach to Mesolithic adaptations severely limited.

CONCLUSIONS

There are two main particularly important points which we can draw from the above discussion. First, that the influence of biases is pervasive. The effects of biases on the distribution of sites are much more far-reaching than we might expect and mean that interpretations drawing on site distributions have little firm footing. Even interpretations based on the composition of assemblages, rather than simply on the distribution of sites, are affected by many different biases. Secondly, the mechanisms of bias are extremely complex. It required detailed analysis to ‘untangle’ the biases that operate in a local landscape, biases which have a serious effect on possible evidence for a continuity of upland activities and occupation. It may not be possible to simply identify biases and account for them.

Essentially, the main conclusion is that the archaeological evidence for large scale patterns in northern England alone, as it stands, is insufficient to 'build up' a model of Mesolithic adaptations. There may be some patterning which does relate to past adaptations, such as the stylistic zones of different microlith forms, or the distinctive division between Early and Late Mesolithic assemblages, however these patterns are far from easy to interpret, without a better understanding of the context of Mesolithic environments, and a framework within which to place interpretations. Moreover, given the possibility of unexplored biases at work they should be used with care.

In the next chapter, chapter three, the basis for the alternative 'bottom up' approach to Mesolithic adaptations, the available evidence for subsistence resources, is considered in detail.