The Neolithic Landscapes of the Cheviot Hills and Hinterland: Palaeoenvironmental Evidence

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Introduction

In a speculative but influential survey of prehistoric activity in Northumberland, Colin Burgess (1984) suggested that the upland massif of the Cheviot Hills remained uncolonised in the Neolithic. Burgess contrasted the lack of archaeological evidence in the hills with the extraordinary concentration of features in the lowland plain abutting the Cheviots, notably in the Milfield Basin (Miket 1976, 1985; Harding 1981) (fig. 1). This comparison formed the basis of a synthesis of population movement in which the lowlands were envisaged by Burgess to have been the focus of settlement in the Neolithic, only for this high level of activity to break down, possibly through soil deterioration, forcing the farming population into the hills at or near the beginning of the Bronze Age.

Burgess' suggestion of an empty Cheviot landscape in the Neolithic is an interpretation based on a lack, or virtual lack, of archaeological evidence. Burgess, Ovens and Uribe de Kellet (1981) argued that stone-axe distributions provide the best means of establishing the principal *loci* of Neolithic activity, and apart from rare and scattered finds of stone axe-heads on high interfluves in the central Cheviots, these portable finds are found most frequently on the lower flanks, below c. 150-200 m OD (Burgess *et al* 1981; Murray, Jane pers. comm.). However, these lower slopes are those most prone to ploughing, and so most prone to artefact discovery, while on upper slopes stone axes are often associated, rather unnervingly, with later archaeological remains as at Hownam Rings (Piggott 1948) and Crock Cleugh (Steer and Keeney 1947). South-draining valleys such as the Rede and Tyne (fig. 1) have comparatively large concentrations of stone axe-heads, and these can be equated in part with the distribution of the few upstanding monuments (extant or now-destroyed) that can confidently be assigned to the Neolithic, such as the group of long cairns around Bellshiel Law in upper Redesdale and Tynedale (Newbiggin 1936; Manby 1970; Masters 1984) and the long cairn on Dod Hill on the east flank of The Cheviot overlooking the River Till (Gates 1982). The only purported Neolithic monuments reported from Cheviot valleys, a possible long cairn at the mouth of the College Burn (Masters 1984), and the remnant of a stone circle at Hethpool, also at the mouth of the College Burn (Topping 1981), are less confidently identified. Notably, since Burgess' essay in 1984, intensive field survey by the Royal Commission on the Historical Monuments of England, on the English side of the Border, and by its Scottish sister body and Historic Scotland, has not added significantly to this meagre corpus.

To the east of the volcanic mass of the Cheviots, the lower-lying Fell Sandstone ridges ringing the Milfield Basin contain more archaeological traces of Neolithic activity, particularly of portable items such as stone axe-heads (Burgess *et al* 1981). A round barrow was excavated in the 19th century at Broomridge, near Ford (Greenwell 1877; Manby 1970), and close by at Chatton Sandyford, a ^{14}C date of c.2890 ^{14}C BC (c.5600 cal. BP) from a cairnfield clearly suggests some Neolithic activity (Jobey 1968).

Pottery finds (Miket 1976) show an even more pronounced lowland distribution, all below 200 m OD, and concentrated in the Milfield Basin. Although biases introduced by varying intensities of antiquarian research and archaeological recovery obviously distort the spatial patterning, the data serve to reinforce the conclusions obtained by excavation of the more substantial remains of the ritual/funerary complex on the fluvioglacial gravel terraces of the Milfield Basin (Harding 1981; Miket 1985). But likewise the siting of these now crop-marked monuments on soils amenable to air-photographic reconnaisance may have skewed the importance of this part of Northumberland in the Neolithic.

The apparent absence of Neolithic activity in the recesses of the Cheviots has been ascribed either to poor-quality soils (Manby 1970) or to the narrowness and limited agricultural potential of the valley floors (Burgess *et al* 1981, Burgess 1984). These drawbacks did not, however, appear insurmountable to later prehistoric and historic farming communities, as the abundant post-Neolithic remains make clear (RCAHMS 1956; Feachem

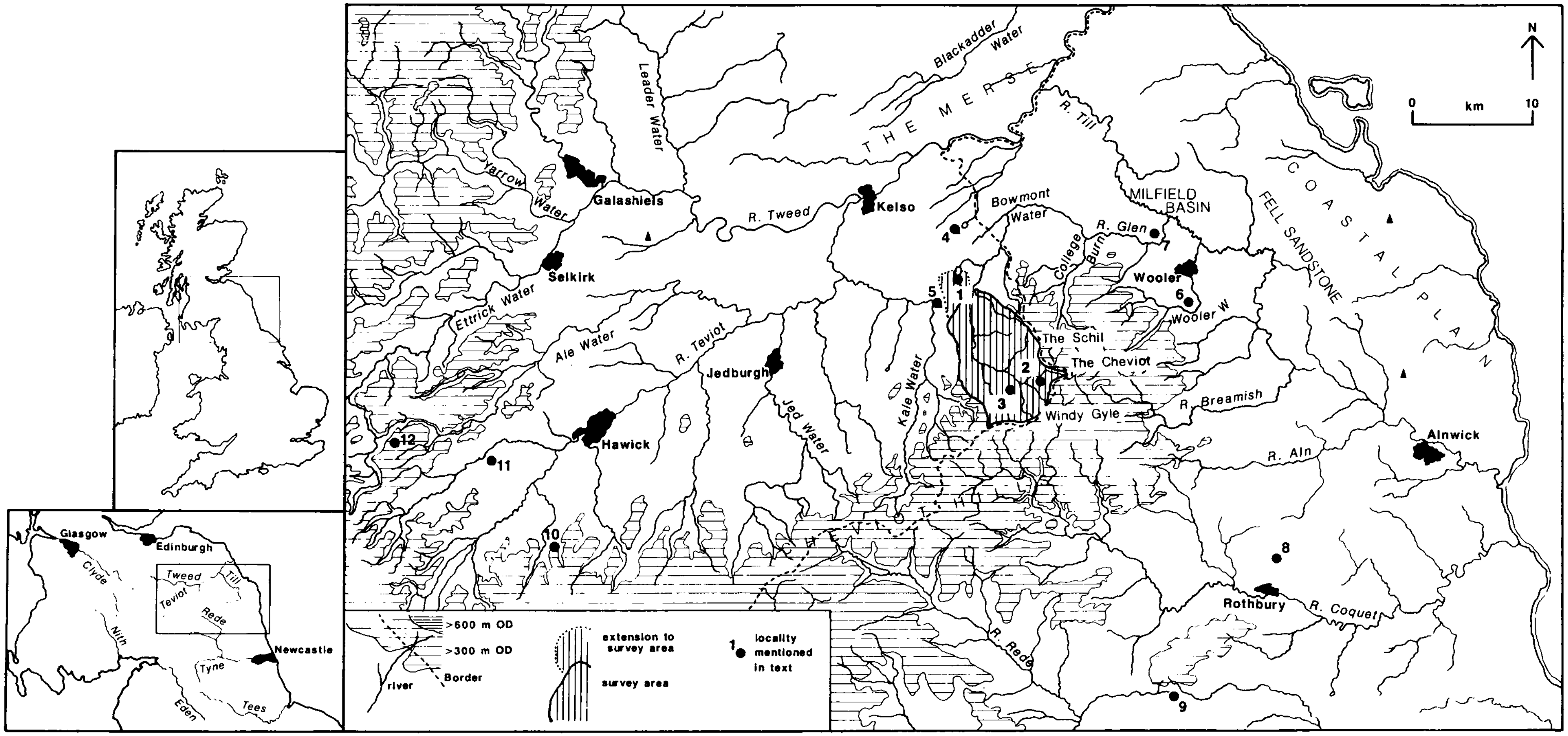

Fig. 1. The physiography and present major settlements of the Cheviot Hills and surrounding lowland, showing the location of the Bowmont Valley Project archaeological survey area, and the palaeoecological sites mentioned in the text.

Key to numbered localities mentioned in text : 1 - Yetholm Loch (Tipping in press a); 2 - Sourhope (Tipping in press a); 3 - Swindon Hill (Tipping in press a); 4 - Din Moss (Hibbert & Switsur 1976); 5 - Linton Loch (Mannion 1978); 6 - Wooler Water (Clapperton et al 1971; Tipping 1992; Harrison & Tipping 1994; 7 - Akeld Steads (Borek 1975; Tipping unpublished); 8 - Callaly Moor (Macklin et al 1991); 9 - Steng Moss (Davies & Turner 1979); 10 - The Dod (Innes & Shennan 1991); 11 - Kingside Loch (Tight 1987); 12 - Wester Branxholme Loch (Tight 1987).

1966; Jobey 1966, 1980, 1981, 1985; Gates 1981, 1983; Halliday 1985; Annable 1987; Clack 1982; Dixon 1985; Topping 1989; Mercer and Tipping 1994; Mercer in prep.). This temporal contrast in archaeological site density in the uplands is as striking as the spatial contrast within the Neolithic. It can be explained, as Burgess (1984) did, as the result of early Bronze Age population movement, but this 'begs the question' as to why these formerly forbiddding hills suddenly offered such exploitative potential.

An alternative suggestion is that the archaeological record for the Neolithic seriously under-represents the extent of human settlement in the Cheviot Hills. This interpretation can only be tested by techniques other than archaeological ones. In this paper the problem of Neolithic occupation of the uplands, its relationship to the more visible archaeological developments in the lowlands, and the mechanisms involved in the change from hunter-gatherer to farmer in these northern hills, will be approached using palaeoenvironmental tools, notably pollen analysis, which frequently allows the identification, though not always unambiguously, of human settlement and agriculture in situations where archaeological evidence is absent.

Mid-Holocene palaeoenvironmental analyses in the Cheviot Hills

Reconstruction of the natural and anthropogenic environments of the Cheviot Hills and surrounding lowlands in the Neolithic could only be sketchily made until recently completed work (Tipping in press a). Pollen analyses from a number of sites had been obtained, principally from the Milfield Basin and Fell Sandstone to the east (Turner 1968; Clapperton, Durno and Squires 1971; Borek 1975; Moyle 1980) but these are not radiocarbon dated. More authoritative analyses were undertaken by Grant Davies (Davies and Turner 1979) in the uplands of the Northern Pennines and eastern Cheviots, with three of the four diagrams accompanied by radiocarbon dates, but only at Steng Moss, near Otterburn (fig. 1), do the analyses extend into the Neolithic. The radiocarbon dated analyses from Callaly Moor, above Rothbury (Macklin *et al* 1991) (fig. 1) similarly do not depict the Neolithic landscape. North of the Border pollen analyses from Linton Loch (Mannion 1978), at the foot of the Cheviots, include Neolithic-age sediments but are also undated. The extensively ^{14}C-dated peat sequence at Din Moss (Hibbert and Switsur 1976), a few kilometres north of the Cheviots, has a well-resolved pollen stratigraphy for the early-mid Neolithic, but above this is truncated, the uppermost c.4500 years of sediment having been lost (Birks 1993).

In 1985 Historic Scotland commissioned a comprehensive archaeological survey of all upstanding monuments within one of the principal northerly-draining Cheviot valleys, the Bowmont Valley (Mercer and Tipping 1994; Mercer in prep.). The area surveyed (c. 52 km^2) is depicted in fig. 1, covering the Bowmont Water drainage network from Primside Mill (114m OD) to the summit ridges north and west of The Cheviot itself (basin length 11.75 km), where hills such as Windy Gyle and The Schil rise a little above a high-level plateau of 490-520m OD. The survey area is predominantly of upland character, much of it lying well above presently cultivable land, and by far the greater part is given over to grazing. Because of these factors there is exceptional preservation of archaeological monuments, as has long been recognised (Piggott 1949; RCAHMS 1956). Below the main watershed are a series of plateau surfaces (Common 1953), separated typically by smooth convexo-concave slopes. The smoothness and gentle gradients of the slopes (3-15 degrees) are products both of a uniform geology (of andesite surrounding a poorly exposed granite core) and of periglacial modification of till-covered bedrock slopes (Harrison 1993).

The need to generate new and securely-dated palaeoenvironmental reconstructions was recognised from the outset, and a programme of research commenced (Tipping 1992, 1994a, in press a; Harrison and Tipping 1994; Mercer and Tipping 1994). The overall aim of the project was an holistic understanding of the principal agencies of change, climatic, anthropogenic and autogenic, in the evolution of this upland landscape from the retreat of local glaciers 10,000 years ago (Clapperton 1970; Harrison 1994) to the present day. The 'backbone' of this work was the detailed temporal and spatial understanding of vegetation patterns throughout the valley from an integrated network of pollen sites, each independently dated (fig. 1). Six sites were investigated, of which three can be used to characterise changes in plant communities during the Neolithic. These three sites, Yetholm Loch, Sourhope and Swindon Hill (fig. 1) form the basis of the reconstructions presented below.

Pollen diagrams from the Bowmont Valley

Yetholm Loch lies 3 km north of the archaeological survey area (fig. 1), west of Town Yetholm, at 101m OD, in a lowland setting more typical of The Merse than the high Cheviot Hills. The loch, a relatively small stretch of open water c.630 by 250m, has at its southern, inflowing end, a shallow but complex sequence of lacustrine sediments some 315 cm deep. Eight ^{14}C assays, supported by pollen-stratigraphic correlation with the well-dated sequence at Din Moss (Hibbert and Switsur 1976) 4km to the north, provides a secure chronology, demonstrating a complete stratigraphic sequence covering the last 10 000 ^{14}C years, the entirety of the Holocene or present interglacial.

Fig. 2 is a simplified pollen diagram of the Yetholm Loch sediments spanning the period 7000 - 4000 cal. BP, plotted against a calibrated age scale. The three relevant ^{14}C dates are also plotted on the extreme right, the relevant depths below ground surface being provided in Table 1a. The shaded curves represent changes through time in the proportions of selected pollen types (taxa) as percentages of all pollen taxa typical of dryland plant communities (total land pollen or tlp: the basis of percentage calculations for each sample is enumerated under 'Total land pollen', generally c.300 grains); crosses are plotted where that taxon is represented at proportions < 1% tlp. The appendix to this paper provides the common names for pollen taxa used in this figure and in figs. 3, 4 and 5: both names are used in the text. The hollow curves represent summaries of the changes in tree, shrub and herb taxa (see Appendix for definitions). Changing proportions through time represent, crudely, fluctuations in the proportions of different plants, though there is no simple relation between palynological and vegetational changes. These changes are conventionally simplified by zonation schemes, as here, where this 3000 year sequence is subdivided into three 'local pollen assemblage zones' (l.p.a.z), D-Fa, which relate only to this site. The interpretation of this stratigraphy is given later.

Sourhope is a 3m thick valley peat lying deep within the upper Bowmont Valley (fig. 1) in a deep valley near the Border ridge between The Schil and Auchope Cairn, at 297m OD. Thirteen radiocarbon dates were obtained on this sequence, and these demonstrate that the peat has accumulated near-continuously from the early Holocene, c. 9500 cal. years ago. A simplified pollen diagram for the timespan 7000 - 4000 cal. BP is presented in fig. 3 in the same way as for fig. 2 (above). Three ^{14}C dates are relevant to this part of the diagram (see also Table 1b), and the period is subdivided into five l.p.a. zones, B-F.

Swindon Hill stands in the middle of the upper reaches of the Bowmont Valley (fig. 1), c.2 km southwest of, and nearly 70m higher than the pollen site at Sourhope. A small enclosed bedrock basin is infilled with peat to a depth of c. 1.5 m. A ^{14}C date at the base of the sequence (GU-2494; Table 1c) show this peat to have begun forming a little over 5400 cal. years ago. Four other ^{14}C dates suggest continuous peat accumulation since then, but with very variable accumulation rates. The rate of peat accumulation between the two dates depicted in fig. 3 (Table lc) is particularly slow, and this is one reason for the period 5400 - 4000 cal. cal. BP being covered by only eight analyses. All are from a single l.p.a. zone, A.

In the next section these diagrams are synthesised, Yetholm Loch and Sourhope serving to depict different aspects of the Cheviot topography until c. 5400 cal. BP, when data from Swindon Hill can be incorporated. In addition, pollen analyses from nearby Din Moss (Hibbert and Switsur 1976) can constructively be used to augment the record from these sites in an exploration of the links between lowland and upland landscapes.

Landscape changes in the Northern Cheviots, 7,000 - 4,000 cal BP

The mid-Holocene forest cover

The interpretation commences well before the nominal beginning of the Neolithic adopted here of c. 6000 cal. BP (Kinnes 1985). By c. 7000 cal. BP all the major forest-forming tree taxa had colonised the Cheviots and adjacent areas. As in areas of northern England (Turner and Hodgson 1979) there was quite considerable variation in the composition of the woodland between The Merse, characterised by oak-elm-hazel (*Quercus-Ulmus-Corylus/Myrica*) woods, and those within the Bowmont Valley, which were dominated by hazel (*Corylus/Myrica*) and birch (*Betula*) to the extent that oak (*Quercus*) was poorly represented, and elm (*Ulmus*) probably not present at all. The establishment of oak (*Quercus*) at Sourhope was delayed by c.800 years after its colonisation around Yetholm Loch and Din Moss. It is most likely that altitudinal contrasts were of secondary importance to edaphic (soil-forming) factors, since similar differences in woodland composition can be seen between the calcareous Carboniferous sandstones, limestones and tills of The Merse and the pollen sites of Wester Branxholme Loch, Kingside Loch and The Dod (fig. 1) on the more acidic rocks of the Lower Palaeozoic Southern Uplands to the west (*eg.* Tight 1987; Innes and Shennan 1991), despite these sites lying at comparable altitudes (Tipping in press a). The final major tree to become established in the Bowmont Valley was *Alnus* (alder), synchronously at Yetholm Loch and Sourhope at c. 7100-7200 cal. BP, and its growth on moister substrates is one reason why this taxon dominates the pollen records throughout the period examined.

Late Mesolithic Woodland Manipulation

There is no evidence for other than natural changes in the structure and composition of the woodlands in the first c.500 years depicted in figs. 2 and 3, or prior to this (Tipping in press a). Proportions of the major tree taxa are unchanging. Openings in the woodland are recorded at both sites after c. 6500-6600 cal. BP, most strongly at Sourhope from c. 6575 cal. BP. At the start of l.p.a.z. Sourhope C (fig. 3) alder (*Alnus*), which was probably growing on the peat surface, underwent marked percentage reductions, as did those of shrub pollen types probably growing in alder carr (*Crataegus* type, ?hawthorn; *Salix*, willow). *Betula* (birch) and *Corylus/Myrica* (hazel/bog myrtle) percentages do not reflect this decline (indeed, *Betula* percentages increase), and together with *Fraxinus* (ash), these taxa may at this time have grown most commonly in 'dryland' woods. Although *Quercus* (oak) values decline only slightly at the beginning of the zone, and rise from then on, *Polypodium vulgare* (polypody) is noticeably less frequently recorded, and if associated with oak trees (Turner 1987), the percentage reductions suggest some change in woodland structure.

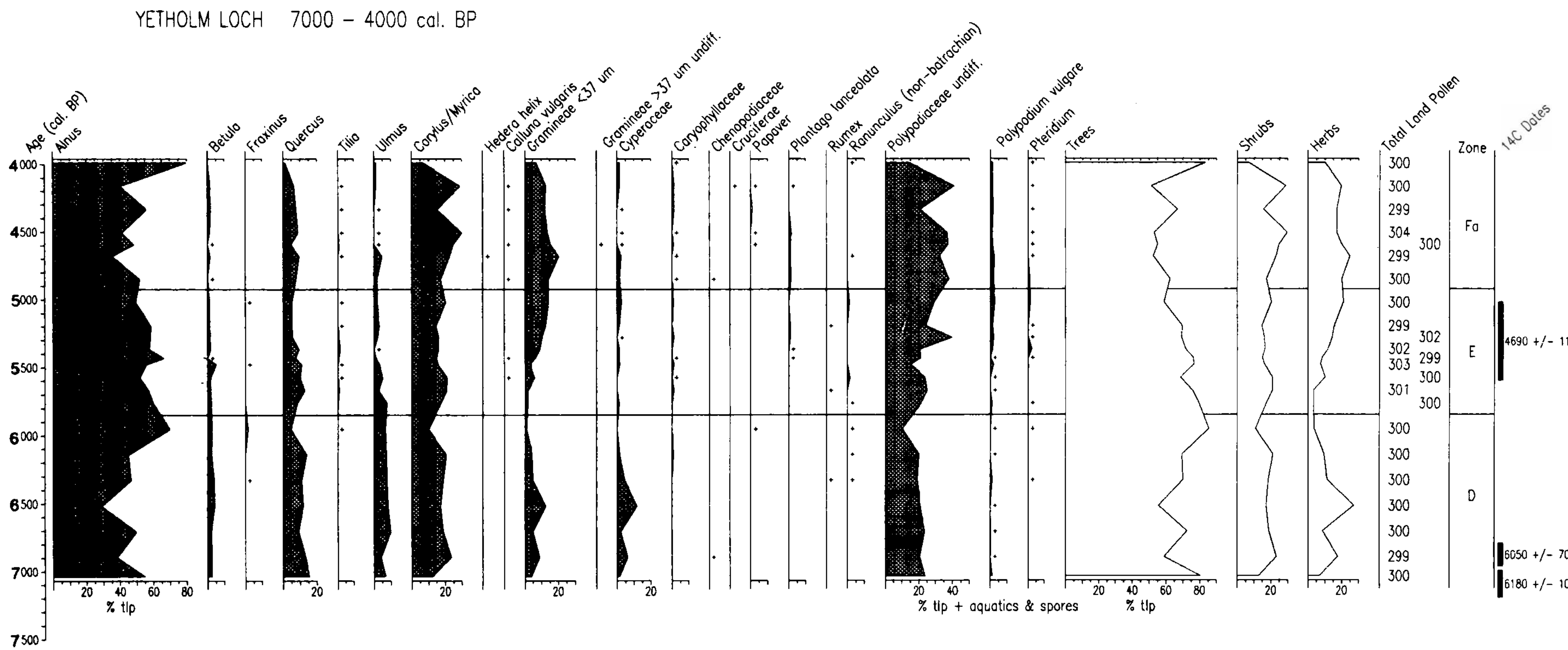

Fig. 2. Yetholm Loch: pollen diagram of selected 'dryland' pollen taxa and spores for the period 7000-4000 cal. BP, based on percentages of total land pollen (sums expressed under 'Total land pollen'), with summary curves of trees, shrubs and herbs (see Appendix and text for explanation).

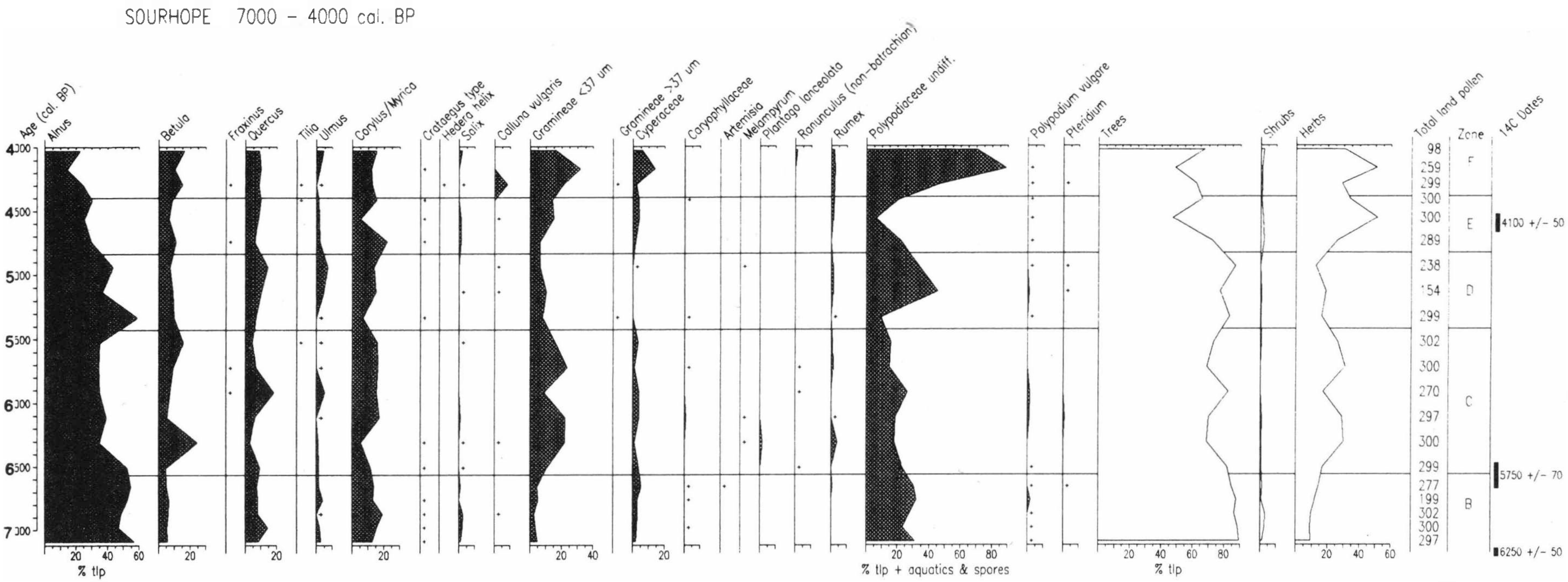

Fig. 3. Sourhope: pollen diagram of selected 'dryland' pollen taxa and spores for the period 7000-4000 cal. BP, based on percentages of total land pollen (sums expressed under 'Total land pollen'), with summary curves of trees, shrubs and herbs (see Appendix and text for explanation).

Values of Gramineae <37µm (wild grasses) are substantially higher, accompanied by open ground herbs not previously recorded, including Cruciferae (cabbage family), Plantaginaceae (plantains, and including *P. lanceolata*; ribwort plantain), 'non-batrachian' (dry-ground) *Ranunculus* (buttercups) and *Rumex* (docks). Present for a short period around 6250 cal. BP is pollen of *Melampyrum*, a plant of open woodland, grassland and dry fen, and often associated with fire-disturbed ground (Caseldine and Hatton 1993).

The apparently greater openness of both carr and 'dryland' woods is suggestive of anthropogenic clearance, and a number of herbs (*Plantago, Rumex*) can be regarded as representing pasture (Behre 1981), so that anthropogenic activity, and more specifically, clearance for grazing, perhaps by fire (suggested by *Melampyrum*), is, perhaps, the simplest explanation for these changes. The clearance phase/s persisted in all for around 1500 years, but gradually increasing proportions of *Betula* (birch) and *Quercus* (oak) suggest that the initial impact was the most extensive or intensive, and partial woodland regeneration followed, after c.6000 cal. BP.

More tenuous evidence for woodland disturbance at Yetholm Loch is closely comparable in age, at c. 6550 cal. BP. Within l.p.a.z. D there are slight suggestions of a more open tree canopy, although no significant changes are seen in the representation of tree taxa, with 'dry ground' *Ranunculus* (buttercups) consistently present, with single grains of *Rumex* (docks, sorrels) and *Pteridium* (bracken). The appearance of *Fraxinus* (ash) may also imply some limited openings in the woodland, the tree being relatively shade-intolerant. Fire probably played no role in creating these woodland openings, given very low counts of microscopic charcoal (unpublished data; Tipping in press a).

The synchroneity suggests that modifications to the woodland occurred throughout the valley, but the changes may have been substantial only in the upper part, where the evidence for clearance by grazing pressures is more compelling. The oak-elm-hazel (*Quercus-Ulmus-Corylus*) woods of the lowlands may not have been as sensitive to change as the perhaps already more open,

Table 1 : Details of relevant radiocarbon assays for (a) Yetholm Loch, (b) Sourhope and (c) Swindon Hill.

LAB. NO. (GU)	MEAN DEPTH (cm)	SEDIMENT THICKNESS (cm)	NO. OF CORES	SAMPLE WEIGHT (gms)	ORGANIC CONTENT (%)	^{14}C AGE BP	1σ	δ13C (‰)	CALIB. AGE & 1σ BC/AD
(a) Yetholm Loch									
-2513	165.5	170.0-161.0	2	281.2	15	4690	110	-29.6	3600(3459)3350 BC
-2665	197.5	200.0-195.0	1	596.0	17	6050	70	-28.0	5064(4971)4885 BC
-2683	202.5	205.0-200.0	1	528.1	20	6180	100	-28.3	5260(5139)5000 BC
(b) Sourhope									
-2394	189.5	186.0-193.0	3	292.7	n.d.	4100	50	-28.9	2728(2657)2586 BC
-2393	248.5	245.0-252.0	3	276.0	n.d.	5750	70	-29.0	4730(4618)4531 BC
-2392	277.5	275.0-280.0	2	223.8	n.d.	6250	50	-28.0	5263(5237)5204 BC
(c) Swindon Hill									
-2492	129.5	132.0-127.0	2	223.2	n.d.	3100	50	-28.6	1442(1389)1321 BC
-2494	151.5	154.0-149.0	2	308.9	n.d.	4720	110	-28.5	3640(3497)3380 BC

Table 1. Details of relevant radiocarbon assays for (a) Yetholm Loch, (b) Sourhope and (c) Swindon Hill.

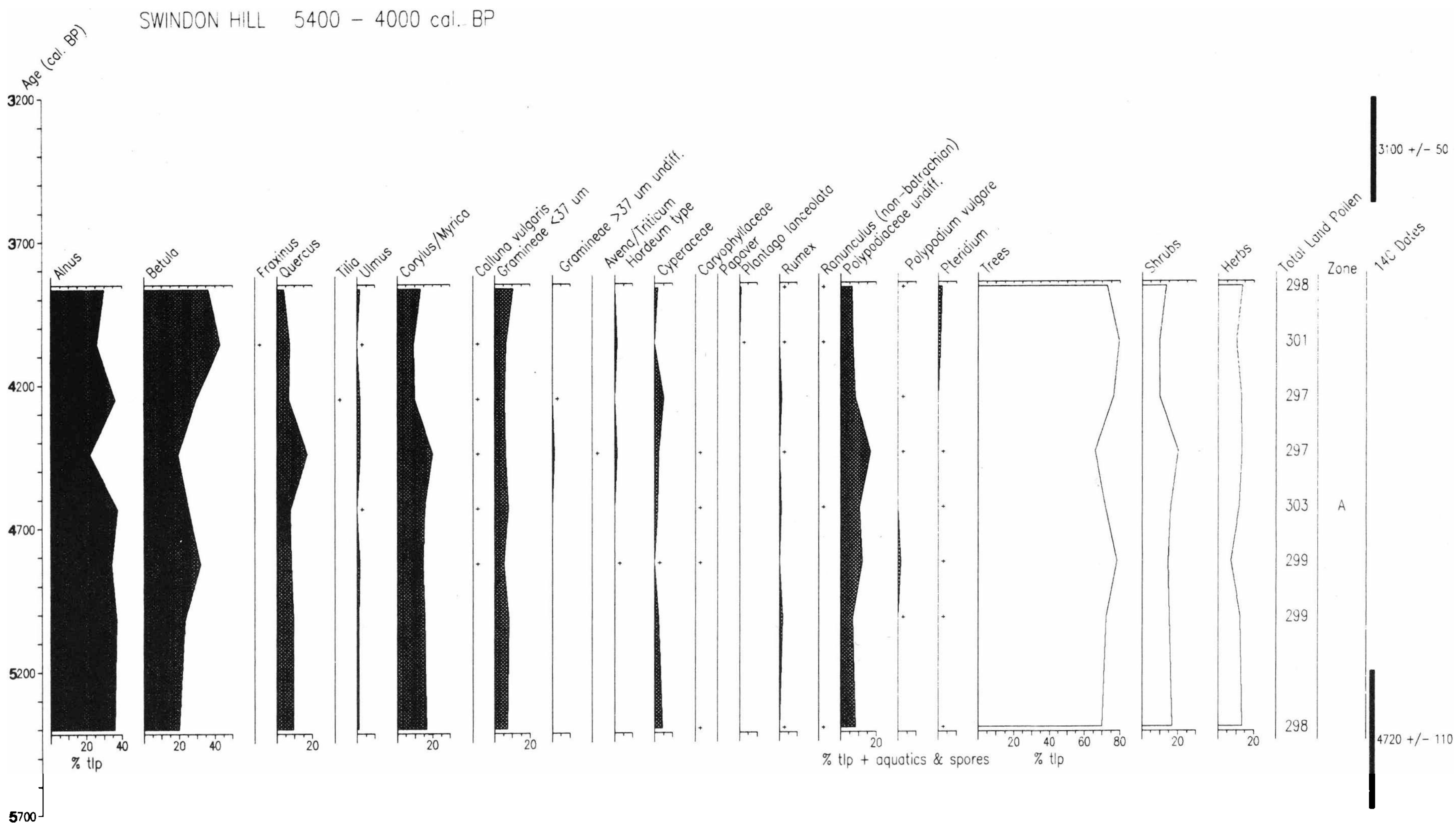

Fig. 4. Swindon Hill: pollen diagram of selected 'dryland' pollen taxa and spores for the period 5400-4000 cal. BP, based on percentages of total land pollen (sums expressed under 'Total land pollen'), with summary curves of trees, shrubs and herbs (see Appendix and text for explanation).

hazel-birch-oak (*Corylus-Betula-Quercus*) woods deep within the valley, or the upland woods may have been easier to manipulate.

These apparently anthropogenic changes are not as early as those recorded in the Southern Uplands at The Dod (Innes and Shennan 1991) at c. 8500 cal. BP, or those undated but coincident with the alder (*Alnus*) rise at Black Lough, Edlingham (Moyle 1980), but accord with the intensification of such activity in the later Mesolithic identified by Simmons and Innes (1987) throughout northern England.

At Sourhope partial woodland regeneration after c.6000 cal. BP appears to signify declining grazing pressure, similar to the pattern suggested by Simmons and Innes (1981, 1988a) for the uplands of northern England. Simmons and Innes (1988b) ascribed this to repeated burning of plant communities leading to soil deterioration and reductions in the nutrient content of grassy sward for grazing animals. Within the Cheviots, there is no evidence for such soil deterioration from either the vegetation record through the establishment of acid heath vegetation (*Calluna* (ling heather) percentages are at every site insignificant; figs. 2-4), or from measures of soil erosion (Tipping 1992, in press a). In lowland areas Mesolithic grazing pressures may not have been so intense as in the uplands (Simmons and Innes 1987), but there is some evidence for woodland disturbance having persisted at Yetholm Loch after c. 6000 cal. BP).

The timing and character of the Ulmus (elm) decline in and near the Cheviot Hills

In the last ten years the elm (*Ulmus*) decline has undergone serious revision from its position as the key biostratigraphic marker for the introduction of a Neolithic farming economy (Groenman van Waateringe 1983; Edwards and Hirons 1984). It is now widely regarded as lying within, rather than at the beginning, of the Neolithic in the British Isles. Two much-discussed lines of evidence have led to this review: firstly, the apparent synchroneity of the event throughout Britain, and secondly, the occurrence of cereal pollen grains, the clearest palynological indicator of agriculture, in pre-elm decline contexts. This is not the place to review these features (see Tipping in press b), but both have a relevance to changes at the Mesolithic-Neolithic transition in the Cheviot Hills.

The apparent synchroneity of the elm decline (Smith and Pilcher 1973; Smith 1981) has led to the suggestion that causes other than anthropogenic activity must have led to the decline in elm pollen, since the human population could not have been so large as to effect this change. Disease (Watts 1961) is probably the most favoured explanation (Girling 1986) as it best explains the rapidity of the decline. However, the elm decline is not necessarily as synchronous an event as some workers believe (Simmons and Innes 1987; Bonsall *et al* 1990; Kenney 1993; Tipping 1994), and the Cheviot hinterland is one region where this appears so.

At Yetholm Loch the elm decline begins at the start of l.p.a.z. E (fig. 2), and is radiocarbon dated by assay GU-2513 (Table 1) to 5550-5300 cal. BP. The elm decline commenced prior to the ^{14}C assay, with *Ulmus* values declining from 8 % to < 1 % tlp over approximately 300 years from c. 5775 to 5490 cal. BP. The age of this event is late compared to the general range (Smith 1981; Kenney 1993) but is internally consistent and unlikely to be in error (Tipping in press a). An elm decline at Sourhope cannot be recognised (fig. 3) because the tree was not locally present. At Din Moss this feature is pronounced and dated by three ^{14}C dates to between 6402-6035 and 6290-5935 cal. BP (Hibbert and Switsur 1976). If the ^{14}C dates at each site are correct (and there is no reason to assume not) then the elm decline at Din Moss, 4km from Yetholm Loch, occurred approximately 3-500 years earlier. This degree of diachroneity over such a short distance is perhaps hard to equate with the idea of a rapidly disseminated disease.

There is no evidence at Yetholm Loch for anthropogenic activity to have been causal in the elm decline there. It is a selective feature, with no anthropochorous herbs recorded (fig. 2). But the suggestion that anthropogenic woodland interference was taking place in the Bowmont Valley in the few hundred years prior to the elm decline (above) is at least suggestive of a continuing interest in woodland manipulation. One piece of evidence suggests that elm trees were dying to create woodland gaps, and were not simply being lopped or otherwise managed (*cf.* Troels-Smith 1960). The appearance of *Tilia* (lime) pollen at the *Ulmus* (elm) decline at Yetholm Loch, even at values of 1 % tlp (fig. 2), probably represents local growth (Pigott and Huntley 1980, Huntley and Birks 1983), but further north by some 150 km than the latitudinal limit conventionally suggested, around southern Cumbria (Pigott and Huntley 1978, 1980). *Tilia* has similar edaphic demands to *Ulmus*, and its colonization at a time when *Ulmus* populations were being reduced may not be coincidental, given the need for openings in the canopy cover of woods for successful regeneration of *Tilia* (Pigott 1975).

Anthropogenic involvement in woodland change at Yetholm Loch is much more readily seen in a more general woodland decline (see 'Trees' curve on fig. 2), particularly of *Quercus* (oak), some 300 years after the start of the elm decline (c. 5500-5400 cal. BP), associated with pronounced increases in wild grasses (Gramineae $<37\mu m$), the first apearance at this site of *Plantago lanceolata* (ribwort plantain) and increases in the representation of *Pteridium* (bracken). But the earliest probable cereal grain is not recorded until c.4550 cal. BP (fig. 2), during a series of complex woodland clearances, particularly of *Quercus* (oak), *Ulmus* (elm) and *Tilia* (lime). Limited amounts of minerogenic sediment were washed into Yetholm Loch following the initial elm decline which may represent some soil erosion accompanying clearance.

Cereal cultivation within the Cheviot Hills

Although pre-elm decline cereal pollen grains have been recorded at many sites (Groenman-van Waateringe 1983;

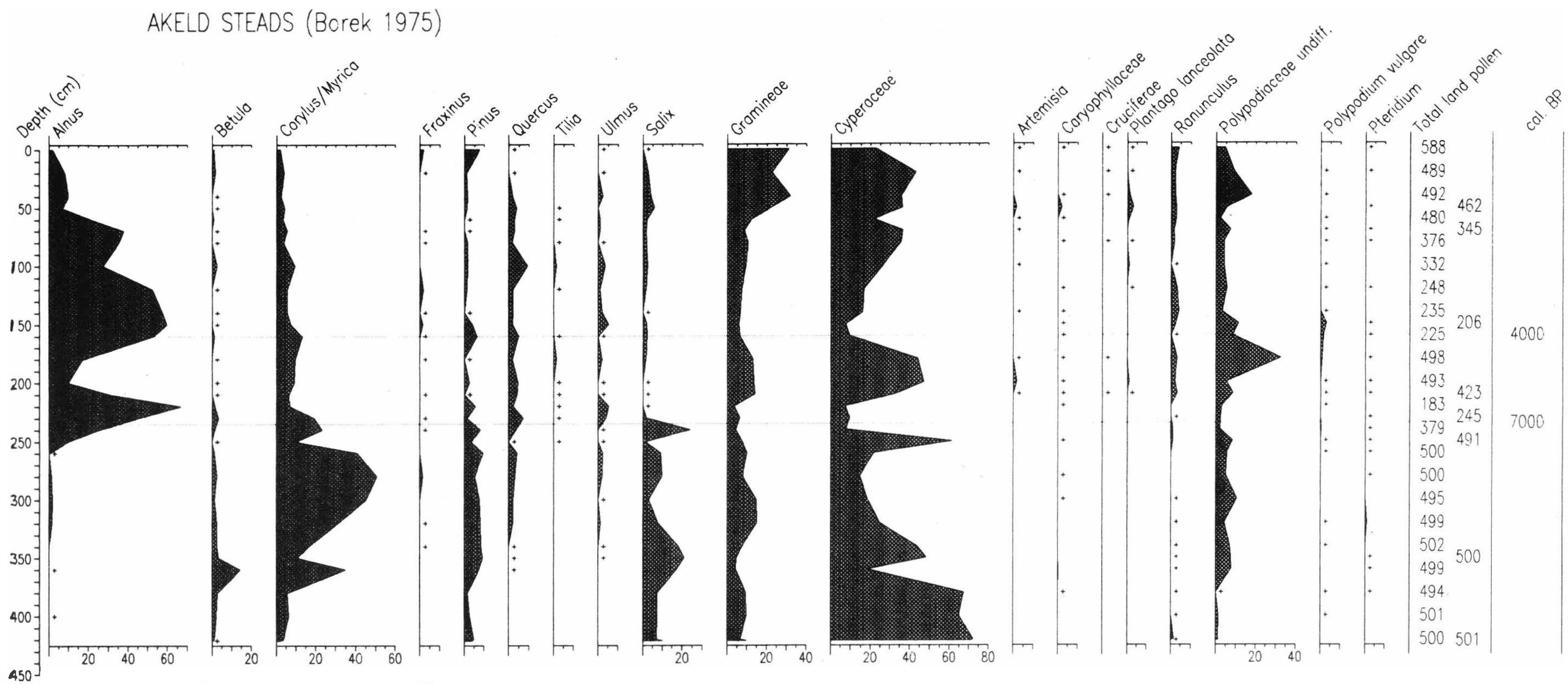

Fig. 5. Akeld Steads (Borek 1975): pollen diagram of selected 'dryland' pollen taxa and spores plotted against depth below ground surface, based on percentages of total land pollen (tlp) for the types Alnus - Ranunculus inclusive (sums expressed under 'Total land pollen') and as percentages of tlp + aquatics and spores for the remaining types (see Appendix and text for explanation).

Edwards and Hirons 1984; Edwards 1988, 1989), including three in Scotland, there are grounds for questioning the reliability of either the identification or stratigraphic interpretations (O'Connell 1987; Tipping in press b). At Din Moss cereal-type pollen grains are recorded very soon after the *Ulmus* (elm) decline, close to 5900 cal. BP. Thus, again assuming the radiocarbon dates at this site to be correct (above), these cereal-type pollen finds are remarkably early, and although post-dating the elm decline at that site, clearly pre-date the elm decline at many other sites, including Yetholm Loch. At Sourhope the earliest find of Gramineae >37µm(fig. 2) also pre-dates the elm decline at Yetholm Loch, at c.5325 cal. BP, but the single grain is not sufficiently distinctive to be confidently regarded as a cereal grain (Tipping in press a). Limited woodland clearance occurred at c.4800 cal. BP, but clearer evidence for renewed anthropogenic activity around Sourhope occurred only after c.3900 cal. BP, with *Quercus* (oak), *Ulmus* (elm) and *Corylus/ Myrica* (hazel/bog myrtle) showing clear and strong percentage reductions (*Ulmus* may have colonised this catchment following the late Mesolithic woodland disturbance; above), with the re-occurrence of *Plantago lanceolata* (ribwort plantain).

Peat growth at Swindon Hill commences within the early Neolithic, at c.5400 cal. BP (fig. 4). Peat formation has in general been linked to human woodland interference through changes in the soil-water budget (Moore 1993), and is possible here but evidence is lacking. The small basin was surrounded by a woodland not unlike that at Sourhope, probably with no elm (*Ulmus*), and with oak (*Quercus*) relatively unimportant. But the peat is very likely to have been occupied by a dense carr of alder (*Alnus*) and birch (*Betula*), and 'dryland' taxa are perhaps under-represented. Grassland existed at the onset of the diagram, with *Rumex* (docks) and *Pteridium* (bracken), which might suggest small-scale clearance to have occurred before 5400 cal. BP, but the key indicator, *Plantago lanceolata* (ribwort plantain) is not recorded until c.3900 cal. BP. However, cereal-type finds are comparatively common from c.4800 cal. BP (fig. 4). Grains are sufficiently well preserved at this site for *Hordeum* (barley) type and *Avena/Triticum* (oats/wheat - presumably wheat at this time; Boyd 1988) to be identified. Cereal cultivation at Swindon Hill continues through the Bronze Age until the early Iron Age (c.2750 cal. BP).

Discussion

The Mesolithic-Neolithic transition in the Cheviot Hills

The pollen diagrams from Sourhope and Yetholm Loch provide some evidence for late Mesolithic human activity in and at the base of the Cheviot Hills, to flesh out the few finds of Mesolithic flint scatters in and around the Cheviots (Weyman 1984). The palynological evidence is most substantial within the hills themselves, at Sourhope, and only tentatively identified further north towards The Merse. Upland localities more commonly record such woodland disturbance (Simmons and Innes 1987), and manipulation of the woodland edge at its altitudinal margins to increase the grazing potential of grasslands has been suggested as a reason for such activity (Mellars 1976). It is, however, very unlikely that the site of Sourhope lay at or even near the upland margin of woodland. No work has been undertaken to define the altitudinal limit to tree growth in the Cheviots (although this is planned), and very few authoritative analyses have been presented for the British Isles as a whole (Birks 1988), but from current work in the Southern Uplands (Tipping unpublished) and from Turner's (1984; Turner and Hodgson 1979) studies in northern England, it is probably not unreasonable to see the Cheviot summit ridges above 500 m OD as cloaked in birch-hazel (*Betula-Corylus*) woodland at c.7000-6000 cal. BP. But the upland woods of the Cheviot Hills were certainly different to those of the lower valley floors in composition (above), and perhaps were always more open, allowing the development of a richer ground-layer flora, and making 'management' easier.

The pollen record at Sourhope suggests an absence of human activity in the earliest Neolithic, in keeping with a number of sites in northern England (Simmons and Innes 1987). However, this woodland regeneration occurs at more-or-less the same time as the woods around Din Moss, in The Merse, were opened up and cereals grown. Whether these palynological changes accurately represent a shift in the focus of human activity is unclear but possible. Reasons might be sought in the greater agricultural potential of the lowland soils as hunter-gatherer communities acquired cereals, or as farming communities possessing cereals settled in the region. Although in general more poorly drained, the Carboniferous-derived tills provide richer soils than the uplands (Muir 1956; above); the comparative abundance of the base-demanding trees, *Ulmus* (elm) and (locally) *Tilia* (lime) in The Merse serve to emphasise this. Resources may have been re-evaluated within the Bowmont Valley, with simple forms of pastoralism in the uplands offering reduced 'returns' through progressive soil impoverishment lowering nutrient yields (Simmons and Innes 1981, 1988a), forcing hunter-gatherer groups to turn to new resources or less intensely used areas. In addition, or alternatively, the new 'cultural package' of domesticated animals and crops may have lured hunter-gatherers away from their hitherto staple resource.

There is thus some suggestion of continuity between 'typical' woodland disturbance of late Mesolithic age and 'classic' Neolithic tree clearance. Small-scale woodland disturbance around Yetholm Loch also appears to commence close to the start of the elm decline at Din Moss (above), but unlike the distinctive removal of elm and planting of crops at the latter site, is, as at Sourhope, rather poorly defined and seemingly more 'indiscriminate'. There is no way of ascertaining whether these apparent contrasts in woodland removal represent the activities of human groups with different cultural affinities. Indeed, current models of the transition from hunting to farming in north west Europe (Price and Gebauer 1992) perhaps make strict cultural definitions unnecessary.

Neolithic settlement within the Cheviot Hills

There is considerable palynological evidence for agricultural activity within the Bowmont Valley in the Neolithic period (above). This contrasts with the archaeological evidence (or lack of it) reviewed by Burgess (1984), and with the lack of palynological evidence for human activity around Steng Moss in Redesdale (Davies and Turner 1979). However, it is clear that the topography of the Cheviot Hills was no more daunting to the earliest farming communities than it was to later settlers. Instead it is likely that the available archaeological data underestimate the level of Neolithic human activity.

A number of reasons for this can be proposed. Domestic sites of this age are notoriously difficult to locate without excavation, possibly because of their construction in wood, though palisade trenches of later prehistoric date are commonly recorded from Cheviot sites (RCAHMS 1956; Mercer and Tipping 1995; Mercer in prep.). More flimsy structures may leave no surface trace, however. Equally, domestic sites which did not involve the degree of earth-moving seen in Bronze Age unenclosed settlements (Burgess 1980; Rideout and Owen 1992) would leave little topographic evidence. It is also interesting to speculate on the commonness of stone-axe and other finds when parts of the Cheviots are de-turfed (above: Piggott 1948; Steer and Keeney 1948; Hope-Taylor 1977) rather than simply field-walked.

In addition to Neolithic settlement sites going unrecorded, it is also possible that sites have been actively eroded or buried. Tipping (1992) described geomorphological evidence within the Cheviot Hills for a series of discrete and major phases of landscape instability. The earliest is of Bronze Age date (c.4800-4250 cal. BP), a second is dated to the late Iron Age/Romano-British period (c.2500-1750 cal. BP), and a final phase occurred within the last few centuries (Tipping 1994). The evidence is in the form of radiocarbon-dated alluvial terrace fills forming the present floors of several valleys. These could readily have eroded any archaeological evidence on valley floors, and/or buried ground surfaces beneath thick terrace accumulations. Equally, eroding soils on valley sides would have been important sources of sediment (Mercer and Tipping 1994), and this process may have removed traces of valley-side occupation.

The Milfield Basin and its Cheviot hinterland in the Neolithic

Harding's (1981) and Miket's (1985) excavations on the gravels of the Milfield Basin have demonstrated the abundance there of late Neolithic funerary activity. Tentative evidence from these excavations also suggests early Neolithic activity in the basin, although continuity of settlement throughout the Neolithic is a matter of conjecture (Burgess 1984). Domestic sites *sensu stricto* have not been located, however, except at Thirlings and Yeavering. It is not possible at present to fully explore palynological data from the Milfield Basin to examine the extent, duration and purpose of Neolithic settlement, although this must be a research priority. One peat deposit very close to the ritual complex (Harding 1981) has been examined, though not dated, at Akeld Steads (Borek 1975) (fig. 1). Fig. 5 reproduces some of the pollen data, re-calculated to a total land pollen sum from the original data, making the diagram more readily interpretable and comparable with most other sites. The diagram is plotted against depth below ground surface, but the period c.7000-4000 cal. BP is delineated, using the ages of biostratigraphic horizons at nearby sites (Hibbert and Switsur 1976; Tipping in press a) and from radiocarbon dates on the peat at Akeld Steads obtained during re-investigation of the geomorphology of the site (below; Tipping 1994, unpublished).

Major interpretative problems in the dominance of Cyperaceae (sedge) pollen (derived from peat-forming plants) mean that changes in other taxa need have little palaeoecological significance. A clear elm (*Ulmus*) decline cannot be recognised because of this factor. Woodland clearance is most readily seen in the expansion of Gramineae (grasses) pollen, and the first occurrence, nearer 6000 cal. BP than 5000 cal. BP, of *Plantago lanceolata* (ribwort plantain), *Artemisia* (mugwort) and Cruciferae (cabbage family), the latter two taxa suggesting clearance for crops, though no cereal-type finds are recorded (fig. 5). The representation of these open-ground herbs in the time-period under examination ceases close to 5000/4500 cal. BP, suggesting an at least partial woodland regeneration, and endorsing this are increases in *Polypodium vulgare* (polypody), associated with wooded landscapes (Turner 1987).

A second pollen diagram from the Milfield Basin, from a shallow peat in the Wooler Water known to contain within it a marked elm decline (Clapperton *et al* 1971) (fig. 1) can be briefly re-examined given that the post-elm decline chronology is now made more secure by a newly obtained radiocarbon date of c.4050 BP (SRR-3658) on the contact between peat and overlying fluvial sediments (Tipping 1992). The pollen stratigraphy is crude (and so is not reproduced here) but agrees with Akeld Steads in showing woodland clearance close to c.6000 BP.

Whilst these pollen records are best assessed with caution they do suggest that the Milfield Basin was, unsurprisingly, settled in the Neolithic, and probably markedly earlier than the construction of the henge-complex (Harding 1981; Miket 1985). The data from Akeld Steads are particularly intriguing in suggesting that some woodland recovery, and thus possibly some reduction in either the nature or intensity of human activity, accompanied the funerary rites after c.4500-5000 cal.BP, at a time when the Milfield Basin became one of the major centres of 'activity' in northern England (Higham 1986; Bradley 1993). More convincing records of land use are needed to explore this apparent paradox further. But a date of c. 4800 cal. BP is significant within the Bowmont Valley, in marking the earliest record of a long-lived phase of cereal cultivation at Swindon Hill (above), and renewed though still small-scale clearance at Sourhope and Yetholm Loch also. One tentatively drawn interpretation of these temporal and spatial land use patterns is that in the later Neolithic the Milfield Basin functioned as a ritual focus for a population that was in fact much more widely dispersed, possibly not even resident in the Basin itself.

Certainly evidence for Neolithic settlement in the Milfield Basin is sparse (Miket 1976; Burgess 1984), but before too much is made of this observation it is important to re-evaluate the geomorphic setting. The ritual complex (Harding 1981) is found only on gravel terrace surfaces that formed in the Late Devensian (Clapperton 1970), and which have been exposed to human activity always since then. Away from this glacio-deltaic surface the basin is occupied by a vast expanse of silts, fine sands and clays (Payton 1980). Although some of these sediments also date to deglaciation of the area (Clapperton 1967, 1971; Payton 1980, 1992), recent stratigraphic investigations at Akeld Steads (Tipping 1994, in prep.) have demonstrated that the great bulk of sediments filling the basin are Holocene fluvial sediments. Furthermore, the processes of sediment infilling have been such as to produce a 'layer-cake' of alluvial sediments. This has significance in three respects. Firstly, contrary to Harding's (1981, 89) view, there is every reason to 'suppose the geomorphology of the basin was much different in later prehistory from what we see now'. Secondly, although the spatial distribution of gravels to finer-grained fluvial deposits has probably remained approximately the same, the mode of sediment infilling means that the present surface of much of the basin is very young, and that the Neolithic land surface remains sealed (and possibly well-preserved) beneath later overbank sediments. Little can therefore be made of the apparent absence of settlement sites away from the gravel terraces; they may be buried.

Thirdly, radiocarbon dating of the inter-digitating layers of peat and minerogenic sediment at Akeld Steads allows an insight into rates of accelerated fluvial activity in much the same way as Tipping (1992) attempted for the Cheviot Hills themselves. Neolithic fluvial activity is not identified from the hills (Tipping 1992; Harrison and Tipping 1994; above), suggesting a relatively quiescent upland environment. There is, however, some evidence for soil erosion in increases in minerogenic sediment in Yetholm Loch as early as c.5500 cal. BP (Tipping 1992, in press a; above). At Akeld Steads the earliest mid-Holocene phase of increased overbank sedimentation, indicative of accelerated flooding frequency, is dated significantly earlier, to c.7400 cal. BP (Tipping in prep.), but a particularly pronounced phase marked by coarser riverine sediment is more loosely dated to between c.5350 and c.4600 cal. BP. The river contributing this sediment at Akeld Steads, the Glen, is the downriver equivalent of the Bowmont Water (fig. 1). A clear association between the extent/intensity of human activity and accelerated geomorphic activity remains unclear (climate change being an equally valid causal mechanism (Macklin, Passmore and Rumsby 1992)) but it is plausible, and the absence of evidence for this Neolithic phase of soil erosion from the uplands (Tipping 1992) might suggest that the Cheviot lowlands, drained by the River Glen, were subject to greater anthropogenic pressures at this time.

Conclusions

The suggestion that the Cheviot Hills were neglected by the Neolithic population of northern Britain has been challenged by new palaeoenvironmental data. A new model of Neolithic settlement is put in its place, of a population widely dispersed throughout both the hills and the surrounding lowlands. It may well prove impossible to demonstrate this from archaeological remains, however, and the absence of archaeological evidence for upland occupation may be real, but the result not of non-occupation but of vigorous soil erosion in the Bronze Age. The use of archaeological evidence from lowland areas such as the Milfield Basin to characterise foci and density of Neolithic settlement is also questioned by similar landscape-taphonomic processes (Zvelebil, Green and Macklin 1993) of fluvial deposition.

The Mesolithic population of the region, also poorly identified from archaeological data, appears from the available evidence to have manipulated the natural woodland most intensively or frequently in the hills (or alternatively the vegetation cover of the uplands is better able to register this, or is more sensitive to slight modification). But this upland activity declined as cereals were introduced and the need for more nutrient-rich soils was realised. Base-rich soils supporting elm may then have been cleared preferentially; palynological data suggest that elm trees were actively removed rather than managed.

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Appendix: Common or English names pertaining to the pollen taxa depicted in figs. 2, 3, 4 and 5.

TREES
Alnus : alder
Betula : birch
Fraxinus : ash
Quercus : oak
Tilia : lime
Ulmus : elm

SHRUBS
Corylus/Myrica : hazel or bog myrtle
Crataegus type : hawthorn or rowan
Hedera helix : ivy
Salix : willow
Calluna vulgaris : ling heather

HERBS
Gramineae <37μm : wild grass species
Gramineae >37μm : grass species possibly but not conclusively representative of cereals
Avena/Triticum : grass species representing either oats or wheat
Hordeum type : grass species representing barley in addition to some wild grass species
Cyperaceae : sedge family
Caryophyllaceae : pink family
Chenopodiaceae : goosefoot family
Artemisia : mugwort/wormwood
Cruciferae : cabbage family
Melampyrum : cow-wheats
Plantago undiff. : undifferentiated plantains
Plantago lanceolata : ribwort plantain
Rumex : docks, sorrels
Ranunculus (non-batrachian) : dryland buttercups

SPORE-PRODUCING PLANTS
Polypodiaceae undiff. : undifferentiated ferns
Polypodium vulgare : polypody
Pteridium : bracken

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