Featherbed Moss

[SK 094 924]

D. Huddart

Introduction

Featherbed Moss occupies the centre of a gently rounded ridge which trends NE–SW at 500–540 m OD, connecting the higher ground of Kinder Scout with that of Bleaklow (Figure 8.57). This ridge forms the watershed between the Shelf Brook and the River Ashop and the moss rises gently to the crest of Salvin Ridge and Featherbed Top (Figure 8.58) and forms an unbroken blanket peat cover, now extensively gullied (Conway, 1954; Bower, 1960a, b, 1961; Radley, 1962; Barnes, 1963). The site is important because it has been studied extensively, is the best-documented Flandrian upland-peat site and has provided important data for many peat-related topics in the Pennines. These include the extent and causes of peat erosion (Johnson, 1957; Bower, 1962; Tanis, 1964a–c, 1965, 1973a, 1981a, 1985a, b; Mayfield and Pearson, 1972; Shimwell, 1974, 1981; Evans, 1977; Lee, 1981; Ferguson and Lee, 1983); the dates of the onset of peat erosion (Tallis and Switsur, 1973; Tallis, 1985a); the rates of peat erosion (Tallis, 1973a, 1981a); the hydrology of blanket peat systems (Tallis, 1973a, 1985a, b); the causes and date of the disappearance of *Sphagnum* from the bog surface (Tallis, 1964a, c, 1985a); and the development of the vegetation record through the Flandrian (Conway, 1954; Talus, 1964a, 1985a, b; Hicks, 1971; Tanis and McGuire, 1972; Tallis and Switsur, 1973). The site is part of the Kinder and Bleaklow SSSI, Derbyshire.

Description

Featherbed Moss has been described by Tanis (1973a) and shows the following geomorphological subregions (Figure 8.58):

1. uneroded peat on the dome-shaped, Featherbed Top summit (544 m OD) and on the surrounding, gently convex slopes;
2. closely gullied peat (type 1 dissection of Bower, 1960a, b) on the Salvin Ridge col, forming an erosion complex of haggs, encircling gullies and bare peat flats;
3. bog slope areas with long, sparsely branched and almost parallel gullies (type 2 dissection of Bower, 1960a, b), draining into the River Ashop headwaters;
4. deeply incised headwaters, which occupy channels that were already in existence when peat began to form on the moss (they occur in Thomason's Hollow and the upper reaches of Lady Clough);
5. oversteepened bare peat faces along the peat margin where it abuts on to steeper slopes;
6. slumped peat, which is located along a considerable stretch of the northern moss margin of the moss and is marked by irregular topography, up to 80 m wide.

The drainage gullies can be seen from aerial photographs to fall into four integrated systems (Figure 8.59): (a) two fan-shaped systems on the western part of the moss occurring in the areas of deeper peat overlying the pre-glacial reaches of the River Ashop, (b) a third fan-shaped system draining the deep peat on the Salvin Ridge col, and (c) a radial system on the convex eastern part of the moss. There is considerable variation in peat depth on the moss (Tallis, 1973a) and the extent of peat build-up has been closely dependent on the subsurface contours (Figure 8.60).

Present-day vegetation

The present-day vegetation is dominated over extensive areas by *Eriophorum vaginatum* (cotton grass), with associated *E. angustifolium.* The stream courses, however, are fringed in their upper reaches by *Rubus chamaemorus* and in their lower reaches by *Empetrum nigrum* (crowberry) and *Vaccinium myrtillus* (bilberry).

Deschampsia flexuosa (wavy-hair grass) is widespread on the drier peat surfaces. All parts of the moss are regularly shot over for grouse in the autumn and probably have been managed by burning in the past, although regular burning now seems confined to the south side where *Calluna vulgaris* (heather) is widespread (Tallis, 1973a).

Extent of peat erosion

Blanket peat covers some 300 km^2 of the southern Pennine uplands (Anderson and Yalden, 1981) and erosion, particularly of the deeper peats is widespread, affecting about threequarters of this area. The extent and severity of this erosion is probably without parallel elsewhere in Britain, and as Conway (1954) described 'there are probably greater expanses of deep and heavily eroded peat than can be found in any other mountain region of the British Isles'. Featherbed Moss has a variety of all the erosional types described by Bower (1960a, b), Radley (1962) and Tallis (1985a). The nature of the peat erosion suggests that dissection is at a relatively early stage and considerable areas of uneroded peat still remain. This erosion appears to be typical of many of the interfluve areas throughout the southern Pennines.

Rates of peat erosion

Peat erosion was directly measured by Tallis (1973a) in a single gully during 1970–1971 as 175 kg, but as he stated this can be no more than a minimum estimate. Accordingly he suggested that a figure of around 300 kg dry weight of peat per year might be more realistic and values of 1000 kg are not impossible. Substantial peat erosion was shown to occur during snow melt and during heavy rainfall, when stream flow rates exceeded 40–50 1 min⁻1. An estimate of the former amount of peat in the gully was made at *c.* 50 000 kg and hence, using the estimated rate of peat erosion, the duration of erosion was suggested as between 200–250 years. As the rate of erosion might be expected to increase progressively, as the gullies become wider and deeper, and more bare peat is exposed, this time period could be longer.

Pollen and macrofossil stratigraphical record and its ^{14}C Dating

The pollen record for this section of the Pennines is given in Conway (1954) and Tallis (1964a) from Goyt Moss, Kinder and Wessenden Head Moor and the peat stratigraphy was divided into three horizons, largely using the presence or absence of *Sphagnum* (Conway, 1954; Tails, 1964a). On Featherbed Moss peat profiles were later obtained by Tallis (1965) and Tallis and Switzur (1973) and also collected from 19 sites by Talus, (1985a). A summary pollen diagram for three sites is illustrated in (Figure 8.61). Earlier work had suggested that distinctive pollen horizons could be recognized in most of the southern Pennine moorlands. Five of these pollen horizons were used to cross-correlate the diagrams, using peat stratigraphy, weed pollen curves and by changes in the pollen spectra from the local bog vegetation, and these were dated by ^{14}C (Tallis and Switzur, 1973), or by documentary evidence where available.

The five horizons were characterized by Tanis (1985a) as follows (Figure 8.61), from the base.

1. An *Ulmus* horizon with the primary decline in the elm pollen about 5500 years BP No ^{14}C dates are available for Featherbed Moss but dates for other southern Pennine sites vary between 5490 years BP at Rishworth Moor (Bartley, 1975) to 4770 years BP at Tolley Moss (Hicks, 1971).
2. Horizon B. The 2685 years BP level at site FW1 ((Figure 8.59); Tallis and Switzur, 1973) coincides with the boundary between the upper and lower peat, which is marked at nearly all the deep peat sites on Featherbed Moss by a change in abundance in *Sphagnum* remains. High *Alnus* (alder), *Fraxinus* (ash) and *Ulmus* (elm) and low *Corylus* (hazel) pollen values occur close to horizon B. Horizon C of Tallis and Switzur (1973) was not used for cross-correlation.
3. Horizon D. Above horizon B, *Plantago* (plantain) increases gradually to approximately 10% Absolute Pollen Concentration (APC) of total non-arboreal pollen (in the Romano-British period) and then declines again. Horizon D was drawn where values decline below 5% APC of total non-arboreal pollen at *c.* AD 400 (documentary evidence from the end of the Roman period).
4. Horizon E. The 1023 years BP level at site FW1 ((Figure 8.59); Tallis and Switzur, 1973) coincides with the culmination of a steep rise in non-arboreal pollen values, a decline in *Alnus* and *Corylus* values and the mid-point of a marked increase in *Plantago* values.

5. Horizon F. The uppermost part of the pollen diagrams is characterized by high values of *Plantago* and *Cerealia* pollen, together with increasing values of *Fraxinus, Pinus* and *Ulmus.* Values of *Plantago* pollen, typically under 25% APC during the medieval period rise sharply to over 50% APC some distance above the level of the Q-849 ^{14}C date of AD 1515 (Tallis and Switzur, 1973). Horizon F was drawn at the mid-point of this *Plantago* rise and dated partly on documentary evidence to *c.* AD 1580 (Scott *et* al.,1973).

There is a pronounced change in the peat stratigraphy along the gullies on Featherbed Moss, as described in Tallis (1965), and there is no doubt that substantial vegetation differences have existed in the past between different regions, although at present these differences are obliterated by a more or less uniform cover of *Eriophorum vaginatum* away from the drainage channels. In the past conditions appear to have been considerably drier on the crest of the interfluve, as is shown by the rather slower rate of peat accumulation here, by the poor representation of *Sphagnum* in the peat, by the frequent records of *Lycopodium* spores and perhaps by the high Cyperaceae values. On the gentle slopes of the interfluve, however, conditions appear to have been much wetter, with a faster rate of peat accumulation and an abundance of *Sphagnum* and *Drosera.* Conway (1954) had recognized a threefold superimposed peat sequence:

1. a highly humified, basal peat, lacking *Sphagnum,* which began to form around 7000 years BP;
2. a humified lower peat, with abundant Ericaceae and Cyperaceae and some *Sphagnum,* which began to form around 5000 years BP or earlier;
3. a less compacted and less humified upper peat, with abundant *Sphagnum,* which began to form around 3200 years BR

Periodic horizontal bands of unhumified *Sphagnum* were thought possibly to be true recurrence surfaces by Tallis (1964a), datable to 3200 years BP, 2600 years BP, 1650 years BP and 650 years BR Rates of peat accumulation, derived from ^{14}C dating are shown in (Figure 8.62) and a chart of the time-relationship of events at Featherbed Moss is shown in (Figure 8.63).

Interpretation

The three major features of southern Pennine peats i.e. the widespread dominance of *E. vaginatum,* the virtual absence of *Sphagnum* and the extensive erosion of the blanket peats, were thought to be the result of drastic modifying factors (Pearsall, 1950). Some evidence suggested that the changes might be relatively recent:

1. the recollections of gamekeepers and shepherds that *Calluna* had decreased at the expense of *E. vaginatum* during the 20th century;
2. the mention by Farey in 1813 of *Sphagnum* as a prominent member of the upland vegetation;
3. the striking decrease of *Andromeda polifolia* in the past 100 years.

Tallis (1964a) suggested in the light of documentary and palynological evidence that *E. vaginatum* assumed dominance after the 14th century as a result of human interference with the vegetation. The modifications produced resulted in a *Sphagnum* decline in the vegetation, but he thought that the almost total absence today of *Sphagnum* can be attributed to atmospheric pollution in the past two centuries. The data collected from Featherbed Moss have been used to provide information on the timing of events and the general levels of human activity in the area around the moss from the pollen record; to reconstruct the bog surface vegetation at different times in the past; to trace the development of the peat blanket there; to make inference about climatic change and the causes and mechanisms of peat erosion and the timing of such erosion. Such data have been summarized in Tallis (1985a, b) and can be applied generally to the southern Pennine uplands.

Pollen evidence of forest clearance, settlement and cultivation (cereal and weed pollen) is most marked above horizon E (*c.* AD 1000) and is corroborated by documentary and placename evidence and must be the result of Viking colonization. The preceding time interval in the 'Dark Ages' appears to have been a time of re-entrenchment of the natural vegetation following disturbance by settlement and grazing in the Iron Age and Roman periods (Hicks, 1971).

Evidence for climatic change

Three main periods of dryness during the bog growth have been recognized, and as the patterns are similar at both eroded and uneroded sites, it is likely that climatic factors rather than local drainage factors were responsible for the *Sphagnum* declines. One coincides with the Little Climatic Optimum of the Early Middle Ages (*c.* AD 1100–1300) (Lamb, 1977), another probably is coincident with the period *c.* AD 800–900 and witnessed by drier conditions at Bolton Fell Moss (see site report, this chapter), and the younger drier phase may coincide with a time period in the past 200–300 years, when there has also been air pollution. Separating these dry phases are two wetter phases, when Sphagnum spread over much of the bog surface at *c.* AD 900–1100 and between AD 1350 and 1750. Earlier there clearly had been wetter climates and *Sphagnum* dominance in all the deeper peat profiles.

The longer term climatic trends during the past 5700 years can be seen from (Figure 8.63). There was a period of relatively dry climate (CR-1) between *c.* 2800 and 5700 years ago, when peat growth was slow; a period of wetter climate (CR-2) between 1600–2800 years ago, during which peat growth increased by 50%; a period from AD 400 to 1000 (CR-3) when climatic conditions appear to have been most favourable for rapid peat growth, and a period covering the past 1000 years (CR-4), when peat growth slowed again to a rate similar to that in CR-1. (Figure 8.63) forms a framework for considering the possible causes of peat erosion on Featherbed Moss and more generally on the southern Pennine uplands.

The causes of peat erosion

The pollen stratigraphical record for Featherbed Moss shows that the modern, degraded, bog surface is not the product of a single process, or a single time period, but has come into being gradually owing to a variety of factors over many centuries. The erosion that we see today is the result of two widely separated temporal erosion phases, the latest initiated 200–300 years ago and still active, whereas the other was initiated 1000–1200 years ago. The recent erosion phase occurs in the context of intensified grazing and trampling on the moorlands and probably owes little to climatic effects. The earlier phase precedes pollen features in the peat profiles that were the result of major forest clearance of the upland hill-slopes in the tenth and eleventh centuries AD and hence Tallis (1985b) suggests that the erosion was unlikely to be the result of human activity. He suggests that it was generated by naturally induced mass movement of the blanket peat over parts of the moss, as suggested by Colhoun *et al.* (1965). Conway (1954) had believed that instability in southern Pennine blanket peats was accentuated by climatic change around 600 BC, leading to the rapid build-up of uncompacted *Sphagnum* peat above more humified peat, and was then relieved by bog bursts around the margins of the peat. Johnson (1957) too had suggested that bog-bursts were a feature of the 'post-mature' stage of peat accumulation, when erosion of the unstable, water-charged peats became inevitable. Bower's (1961) recognition of climate and landform as the major factors governing the present-day distribution of erosion implies that erosion may be an intrinsic property of peats in certain topographical situations. Three lines of evidence point to mass movements as a primary cause of the erosion. There is firstly, the broad, irregularly furrowed, peat zone along the northern edge of the moss where the topography is similar to some recorded bog slides (Crisp *et al.,* 1964) and where more pronounced indentations at intervals along the peat margin could be interpreted as sites of former local bog bursts associated with the slides. Secondly, the peat stratigraphy of sites in this marginal zone differs from sites elsewhere on the moss. The bog surface over this area appears to have suffered a major drying-out some 1100–1200 years ago, from which it never recovered. Although this drying-out was present elsewhere on the moss, in other areas active peat growth recommenced widely after *c.* AD 1000. Thirdly, a case is made by Tallis (1985b) for potential instability, which developed on the margins of the moss as a result of the peat build-up. These factors together caused the various types of erosion between AD 800 and 1000: peat slides at the northern edge of the moss, accompanied by local bog bursting; incision of a deep stream channel at the head of Thomason's Hollow; partial drainage by this stream of pools and hollows in the low relief hummock–hollow complex on Salvin Ridge and the unbranched gullies on the bog slope.

Abundant *Sphagnum* remains persist in the peat profiles to within 3–5 cm of the surface but within the past 200–300 years *Sphagnum* has disappeared from virtually everywhere on the bog surface and it seems clear that atmospheric pollution has been largely responsible (Tanis, 1965; Lee, 1981, Ferguson and Lee, 1983). In the same time period rapid extension of gullying after *c.* AD 1700 seems to have taken place, with at least 200 m of stream course developing within the past 200 years (Tallis, 1965).

It seems likely that this evidence from Featherbed Moss can be applied widely in the southern Pennine uplands. The Kinder and Bleaklow plateaux have had a similar general history and therefore erosion must have been a feature of these landscapes for at least 1000 years. As air pollution is greater over the southern Pennines than any other area of upland Britain it is no surprise that erosion should be so spectacular in this area. However, Tallis' work overall has one major conclusion and that is that biotic factors are not a major cause of much of the erosion. At the level of the stratigraphical changes that have been interpreted as indicative of the first phase of erosion of the peat blanket, the pollen evidence suggests that forest clearance and agriculture in the uplands was minimal. The major expansion of herbaceous pollen associated with Viking penetration of the upland valleys occurred later, its lower limit dated to AD 927 ± 50 years (Talus and Switzur, 1973). The Viking colonization is indicated from the placename evidence (Ekwall, 1922; Barnes, 1962; Cameron, 1959), but the Vikings undoubtedly occupied a landscape in which erosion was already active, as indicated by the terms of Norse origin to describe erosion features (hagg, grain and grough).

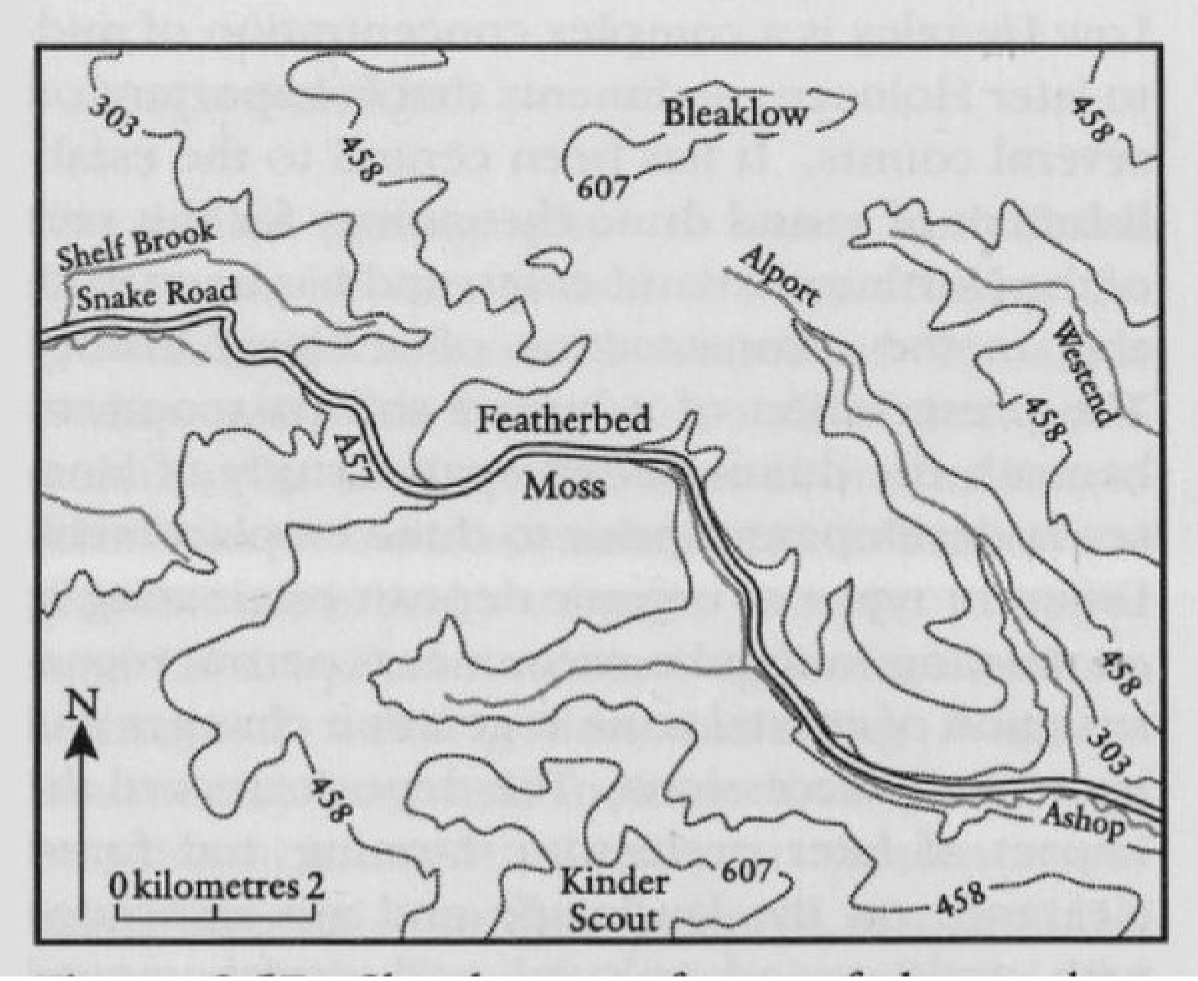
However, in a sense biotic factors can be held responsible for this early phase of erosion, as the exploitation of the southern Pennine uplands as grazing land for wild game by Mesolithic hunters prior to 5000 years BP led to a gradual degeneration of the upland forest under the combined effects of grazing and regular burning (Jacobi *et al.,* 1976) and to a takeover of the flatter ground by peat-forming communities. If this had not happened so early then peat might not even now have built up to a critical instability at the margins.

Nevertheless there are parts of the erosion system that cannot be covered by this explanation. Several large areas of erosion at the pres ent day are known to have been caused by catastrophic accidental fires in the past 50 years and a number of similar areas also are suspected to have been burned at some time (Tallis, 1981b). Active erosion at the peat margin in a number of places also is being accentuated, if not actually caused, by intensive sheep grazing (Tanis and Yalden, 1984). Continual erosion along long-distance footpaths is another recent additional factor (Shimwell, 1981). It appears therefore that the upland peat system is inherently unstable and its break-up can be triggered in a number of ways. Featherbed Moss shows that the peat erosion has been a natural component of the uplands for at least 1000 years and that even a degrading peat blanket can be a long-term component of the landscape.

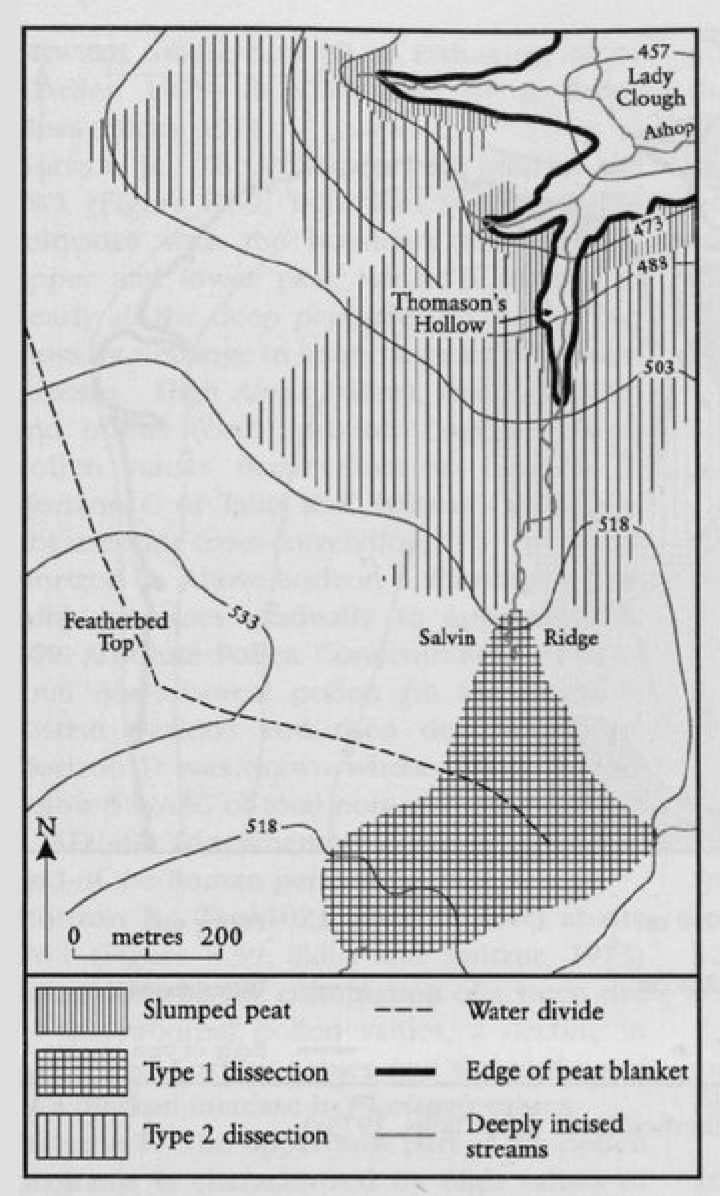
Conclusions

Featherbed Moss has been shown to be an important southern Pennines site that well documents several themes related to the development of the upland landscape. It shows the development of the vegetation, the chronology of changes, and the timing and the development of the major peat erosion. This erosion is shown to have multiple causes but is thought to be predominantly a natural process, the result of inherent instability within the blanket peat.

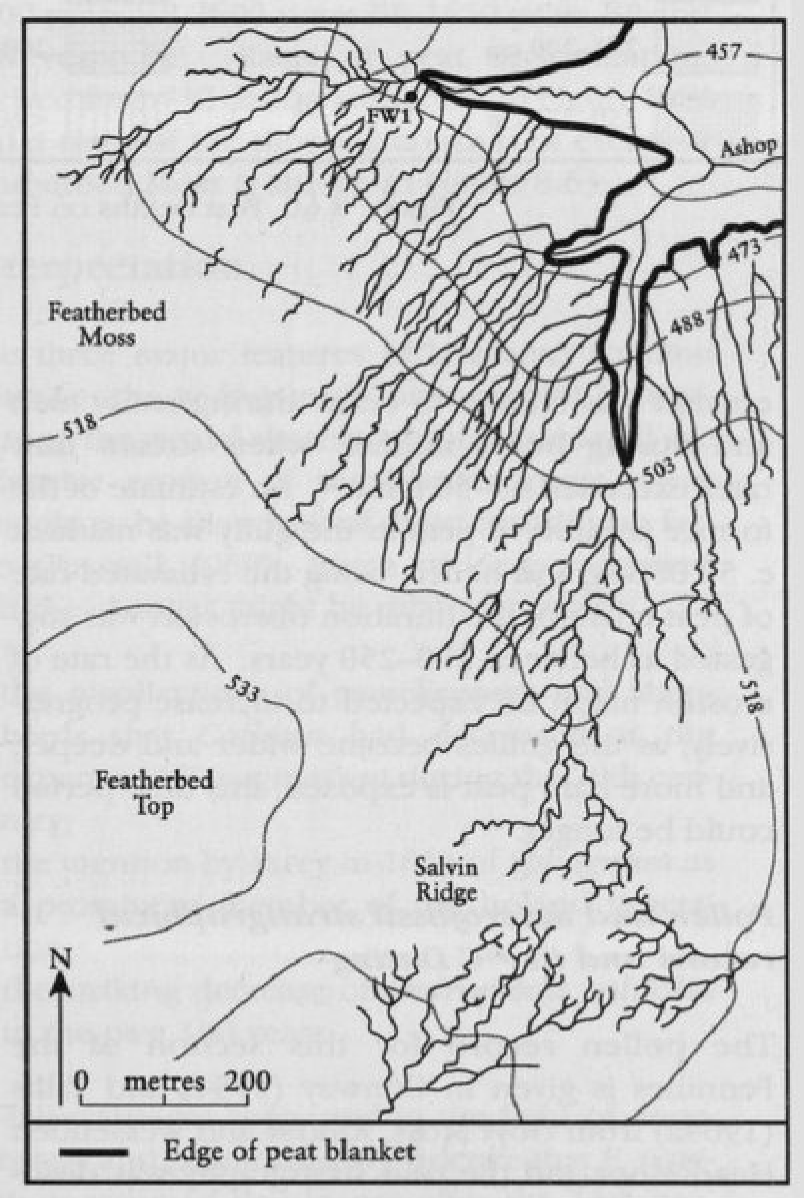
References



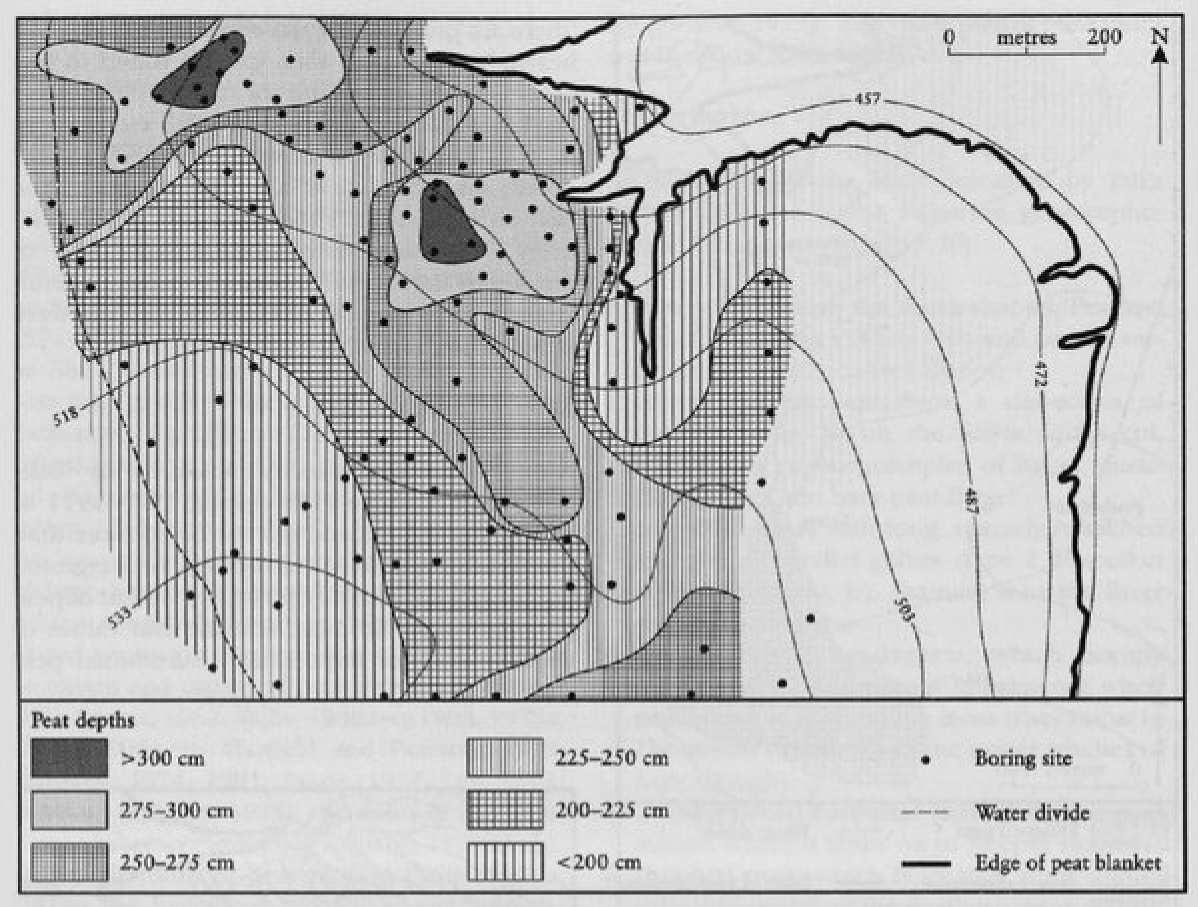
(Figure 8.57) Sketch map of part of the southern Pennines showing the position of Featherbed Moss.



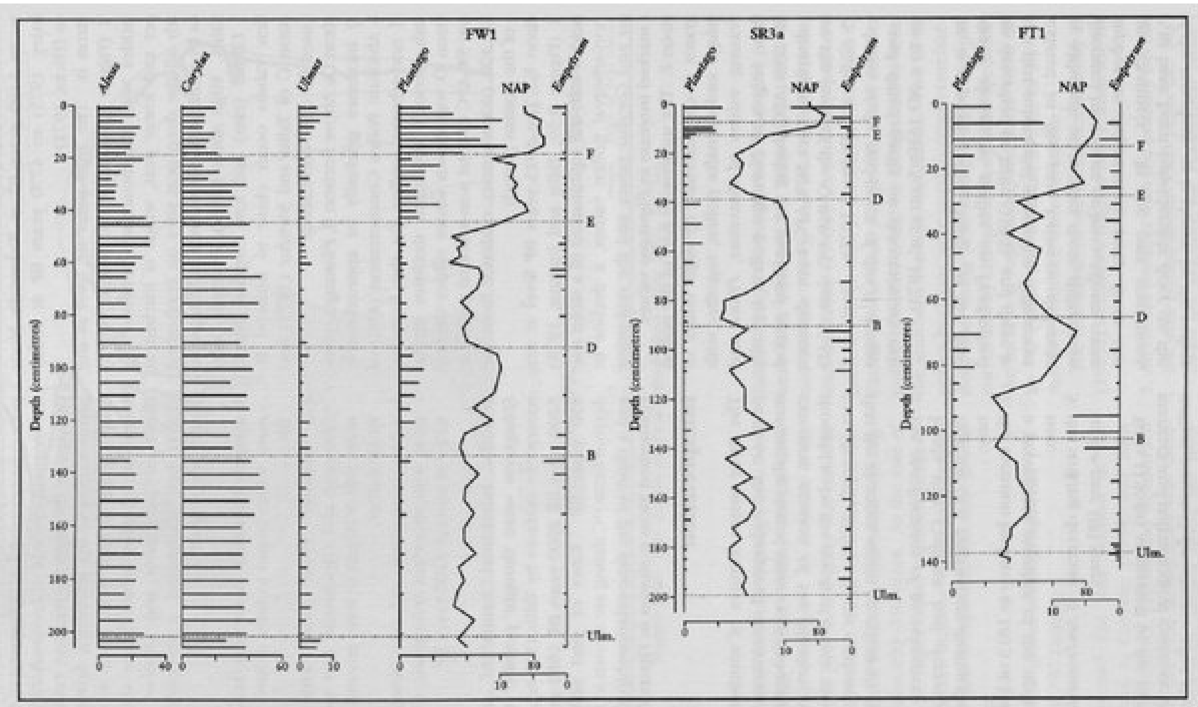
(Figure 8.58) Map of Featherbed Moss showing main topographical features (after Tallis, 1973a).



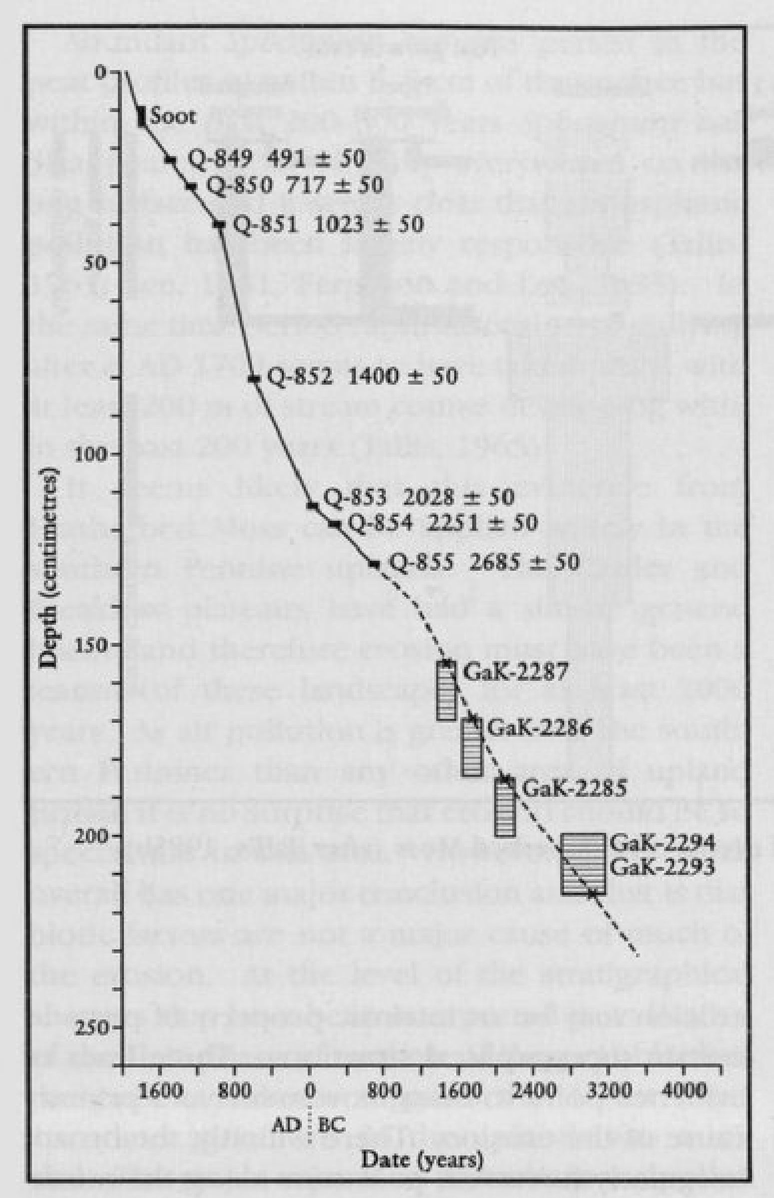
(Figure 8.59) Map of Featherbed Moss showing extent and distribution of gullies (after Tallis, 1973a).



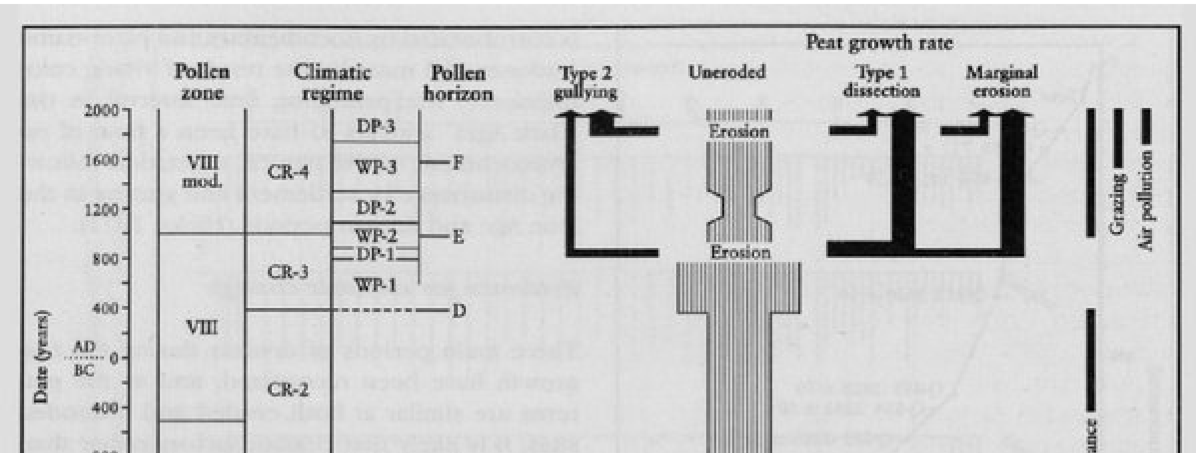
(Figure 8.60) Peat depths on Featherbed Moss (after Tallis, 1973a).



(Figure 8.61) Summary pollen diagram for three sites at Featherbed Moss showing percentage values of Plantago pollen (left-hand histogram), percentage Empetrum pollen (right-hand histogram). Ulm., B, C, E and F refer to pollen horizons described in the text (from Tallis, 1964a).



(Figure 8.62) The rate of peat accumulation at Featherbed Moss (after Tallis and Switzur 1973).



(Figure 8.63) Chart showing time-relationship of events on Featherbed Moss (after Talus, 1985b).