Scaleby Moss

[NY 430 635]

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Introduction

Scaleby Moss, Cumbria, is an ombrotrophic raised bog in an enclosed hollow in the Scottish Readvance till, which developed in a lake that was initiated in the Late-glacial period. The hollow once contained a single large raised bog but the surface peat has almost entirely been cut for fuel and the moss is now divided into two sections, the western Moorcock Plantation, covered by a birch-pine woodland and the eastern Scaleby Moss (Figure 8.2). It is important because it was one of the first sites to have its detailed pollen record and zonation dated by the ^{14}C method and this has provided a geochronological framework for interpreting the environmental history. It is a key site for reconstructing the Late-glacial and Flandrian vegetation change in the Cumbrian lowlands and it provides important comparisons with the vegetation history in the adjacent northern Pennines and Lake District.

Description

The stratigraphy shown from borings and from cut faces records a hydrosere beginning with an open lake and progressing to a *Sphagnum*-dominated, raised bog (Godwin *et al.,* 1957). Immediately above the basal till is a thin and intermittent, grey, sandy clay (*c.* 2 cm thick) succeeded by a buff, organic mud, which becomes sandy and contains occasional pebbles near the top. In the middle of the bog this layer is *c.* 60 cm thick. Above, the mud becomes darker and silt-free but contains increasing quantities of *Sphagnum cuspidatum* with grass and sedge stems, fruits of Carex species and seeds of bog bean. The mud changes vertically into a dark-brown, highly humified *Sphagnum* peat, containing locally varying percentages of *Trichophorum caespitosum, Eriophorum vaginatum, Eriophorum angustifolium* and *Calluna vulgaris.* The maximum depth of *Sphagnum*-rich mud and humified peat is *c.* 5 m. About 1 m below the original bog surface, the humified peat is superseded by a fresher, *Sphagnum* peat and the transition usually is marked by a thin (2–5 cm) of pool peat. The upper peat is not homogeneous and contains a number of laterally intermittent, recurrence surfaces.

A coring in 1950 near the bog centre resulted in a pollen diagram (Scaleby Moss A) shown in (Figure 8.3) from the Late-glacial to the recent past (Godwin *et al.,* 1957). In 1955 a pit was dug and a monolith taken close to the core location for laboratory examination and pollen analysis. This resulted in Scaleby Moss B and C pollen diagrams ((Figure 8.4) and (Figure 8.5)), which were zoned (Godwin *et al.,* 1957; Walker, 1966b). After each pollen analytical horizon had been identified in the monolith, samples were taken for ^{14}C dating. The dates are shown in (Table 8.1) and detailed stratigraphical descriptions are given in Walker (1966b).

Interpretation

The pollen record

It appeared that the results of the dating were trustworthy as the sample ages corresponded to the depositional sequence and the boundary dates were compared with dates in The Netherlands and Denmark (Godwin *et al.,* 1957). The earliest pollen zone at Scaleby Moss (C5) corresponds to British Zone 11 and was represented between 127 and 122 cm at Scaleby B, where dry-land herb pollen dominated over trees and shrubs. Birch pollen was almost totally dominant in the trees. *Artemisia* and *Rumex* values fall through the zone and Cyperaceae are much more abundant than Graminae. In C6 (122–112 cm) dry-land herb pollen was dominant over trees and shrubs. Pine was more frequent than previously and *Artemisia* and *Rumex* values were low. *Empetrum* attained a maximum at the top of the zone. Juniper is consistently present though not important and *Betula nana* is present throughout. In C7 (112–95 cm) tree and shrub pollen account for only 10% or under of the total pollen. Willow was more important than earlier. In C8 (95–72 cm) pine rises to 20% of the tree pollen, with the zone very uniform, except for a central maximum of *Artemisia.* In C9 (470–385 cm, Scaleby A) trees and shrubs are more abundant than dry-land herbs, birch is dominant but pine never exceeds more than 10% of the total tree pollen. Hazel, juniper and willow occur in higher frequencies than previously. A subdivision of the zone into British Zones N and V has been attempted and the boundary drawn where the juniper, willow, grass and Cyperaceae curves fall from high to low values (Scaleby A at 440 cm and Scaleby B at 47 cm) and where hazel becomes consistently present in (Figure 8.3). In C10 (Scaleby A at 385–340 cm) hazel is the most important tree, with birch values falling, as the elm value reaches about 10% of the tree pollen. In C11 (Scaleby A at 340–285 cm), birch values fall slowly, elm is at about 10% and oak rises from zero at the base to about 25% at the top.

Zone C12 (Scaleby at A 285–250 cm) coincides with the 'Boreal–Atlantic Transition' and the rise of alder from zero at the base to 45% of the total tree pollen at the top is associated with considerable fluctuations of the other tree types. In zone C13, which coincides with British Zone VIIa (Scaleby A at 250–230 cm), pine values fall to a minimum, elm maintains 20% and other tree curves are variable, although hazel is considerably higher than in the previous zone. By C14 (Scaleby A at 230–210 cm) elm shows a marked but temporary fall and oak rises at the top of the zone. In contrast, in zone C15 (Scaleby A at 210–195 cm) elm rises to a well-defined maximum and oak falls slightly at the top. In zone C16 (Scaleby A at 195–150 cm) elm falls steeply to almost zero and pine and hazel recover slightly. At Scaleby B a major recurrence surface corresponded to a level of 170 cm in the pollen curve from Scaleby A, which was dated to 3471 ± 130 BC. Zone C17 (Scaleby A at 150–100 cm) is rather ill-defined but alder remains at about its post-glacial maximum and oak is rather lower than alder. Elm recovers at the top of the zone, marking the height of its recovery. Lime is rare and ash occurs only sporadically. In Scaleby B a minor recurrence surface, equated with the level 115 cm in Scaleby A, is dated at 2481 ± 130 BC. In zone C18 (Scaleby A at 100–77 cm) elm falls to zero, oak is higher and alder lower than in the previous zone. Ash becomes consistently present in the upper part of the zone and hazel falls to a minimum. A minor recurrence surface was dated to 1936 ± 130 BC. In zone C19 (Scaleby A at 77–5 cm) birch rises, oak falls, beech is recorded from the lower part, ash is in significant quantities, alder fluctuates and elm is insignificant.

(Table 8.1) Radiocarbon dated pollen zone horizons at Scaleby Moss (after Godwin *et al.,* 1957)

Sample number	Depth related to pollen diagram B or C (cm)	Pollen zonation	Age (years BP)
Q172	67.0–69.0 B	Zone VIIb base	5030 ± 119
Q171	69.0–71.0 B	VIIa/VIIb boundary (Atlantic Sub-boreal/transition)	4975 ± 134
Q173	71.0–73.0 B	Zone Vila top	5037 ± 122
Q166	174.5–176.5 B	Zone VIIa base	6998 ± 131
Q165	176.5–178.S B	VINIIa boundary (Boreal/Atlantic transition)	7475 ± *c.* 350
Q167	178.5–180.5 B	Zone VI top	7404 ± 146
Q161	–0.5–1.5 C	Zone VI base (V/VI boundary)	9052 ± 194
Q162	3.5–5.5 C	Zone V fop	8859 ± 192
Q155	44.5–46.5 C	Zone V base	9790 ± 183
Q154	46.5–48.5 C	N/V boundary (Pre-boreal/Boreal transition)	9607 ± 209
Q152	69.5–71.5 C	Zone N base	10 203 ± 193
Q151	71.5–73.5 C	III/TV boundary (Post-glacial/Late-glacial transition)	10 307 ± *c.* 350
Q153	73.5–75.5 C	Zone III top	10 368 ± 215
Q144	109.5–111.5 C	Zone III base	10 878 ± 185
Q147	123.0–125.0 C	Zone II top I combined [with Q148]	10 748 ± 207
Q148	125.0–127.0 C	Zone II top — [see Q147 age]	

The ecological development of the moss

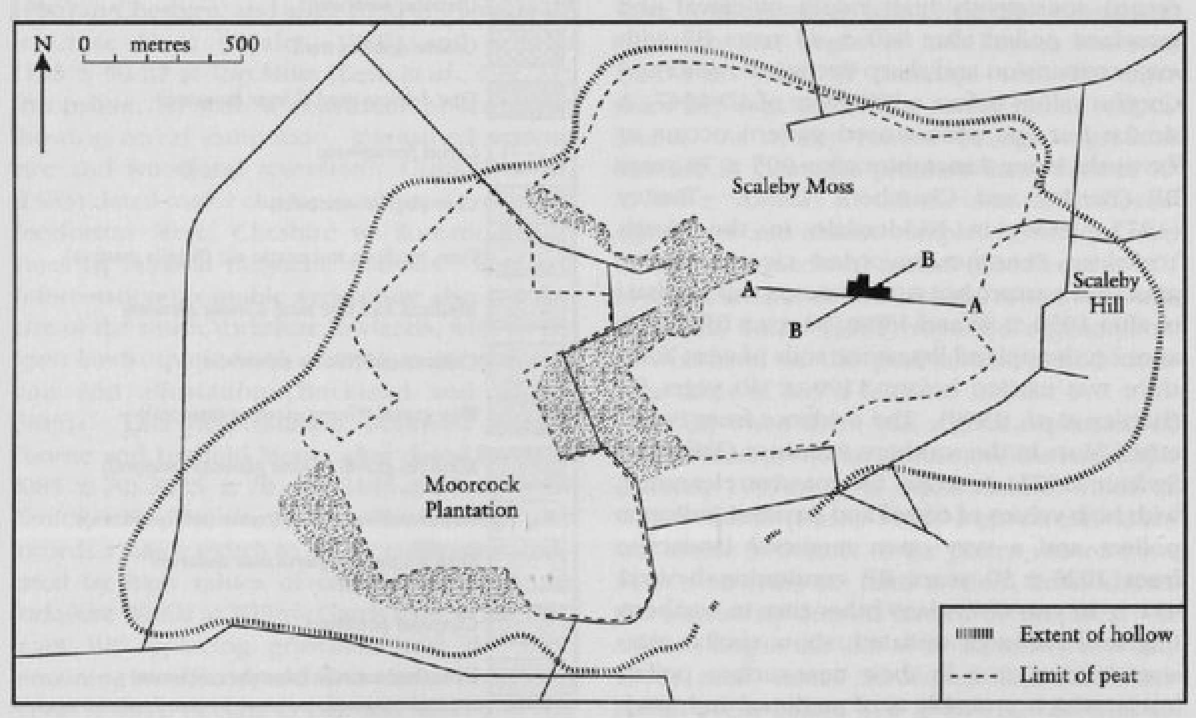
The accumulation of organic mud under open water began before 9000 BC and continued through zones C5–8, probably until about 8200 BC. During zone C5 the basin must have contained a rather barren pool with *Myriophyllum alterniflorum* and *Potamogeton* species and a narrow, fringing reedswamp. In zone C6 the aquatic flora changed little but the reedswamp became more extensive and *Equisetum* species advanced into the shallow water. In zone C8 the inorganic content of the mud increased considerably, with the occurrence of coarse sand and pebbles near the middle of the lake. Walker (1966b) suggests deposition by ice floes to explain this, which increased the base status of the water owing to the influx of inorganic sediments from the banks. The opening of zone C9 saw the rapid overgrowth of the whole lake by reedswamp to produce a poor fen, but by mid-C9 acidification of the reedswamp was taking place. The conversion to a wet, *Sphagnum* bog was complete by about 7500 BC. The development of the raised bog was a fairly uniform process in which *Sphagnum* was most important, although peat layers rich in *Calluna vulgaris, Eriophorum vaginatum* and *Molinia caerulea* are found. During C16 peat accumulation changed and there were periods with very rapid accumulation, alternating with periods when peat accumulation slowed or stopped entirely (recurrence surfaces). The recurrence surfaces indicate changes in the rate of accumulation, which probably are related to changes in precipitation (Godwin, 1954), possibly owing to a sequence of increases in rainfall (Walker and Walker, 1961). The greater part of the central area of Scaleby Moss was above the main effects of groundwater by C16.

The first unequivocal evidence of established clearings in the forest occurs in zone C19 at about 1950 BC, which is late for the Cumbrian lowlands (Walker, 1966b) and this continued at a greatly increased rate from about 1400 BC. The elm decline of zone C16 in the lowlands was probably the result, in the uninhabited areas, of progressive soil depauperization but the effects of this process were totally overshadowed by human activity over considerable parts of the area, and it is to these that the total extinction of the elm at Scaleby Moss must be attributed (Walker, 1966b). Walker (1966b) suggested that there were early Neolithic clearances at sites such as Ehenside Tarn and Abbott Moss, and it was in areas of better soils (sandy, gravelly and therefore lighter) that were most early affected, but clearance at sites such as Scaleby Moss, on low-clay areas were delayed until a new economy, more sedentary and utilizing cereals, became established. The vegetational history in north-west England after 6000 years BP is illustrated in (Table 8.2), where the comparison can be made between Scaleby Moss, Ehenside Tarn, Barfield Tarn and the valleys of the Lake District. The major differences between Scaleby Moss and the sand and gravelly soils of the coastal plain can be clearly seen and this also contrasts with the inner Lake District, with their early Neolithic clearings.

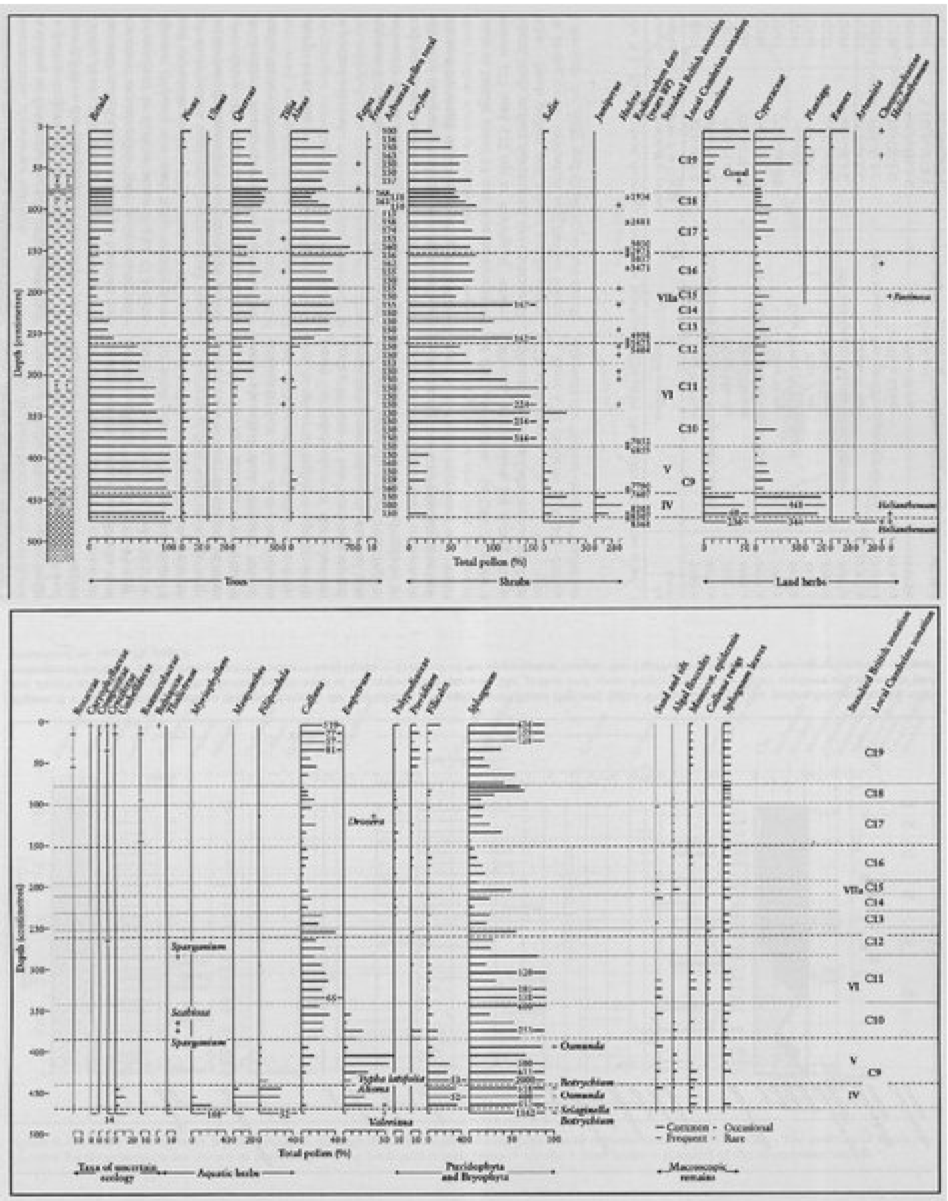
Conclusions

Scaleby Moss is an important site in Britain as it was one of the sites where the detailed Flandrian pollen record and zonation was first dated accurately using the ^{14}C method (Godwin *et al.,* 1957). It shows a classic raised bog development with recurrence surfaces in its upper part and it was a key site used by Walker (1966b) in his detailed interpretation of the vegetational development and change in the Cumbrian lowlands. It contrasted with many other sites because it was developed in clay-rich soils of the Scottish Readvance, which were derived from proglacial and glaciolacustrine silts and clays that were incorporated into the readvance till (Huddart, 1970). It can be used to compare and contrast the vegetation change and development with the nearby uplands in the northern Pennines, such as Valley Bog or Red Sike Moss, Upper Teesdale and the Lake District, such as Blelham Bog or Low Wray Bay. It can be compared with the recent detailed pollen, macrofos-sil and palaeoclimatic proxy records from the nearby Walton and Bolton Fell Mosses in similar raised bog successions.

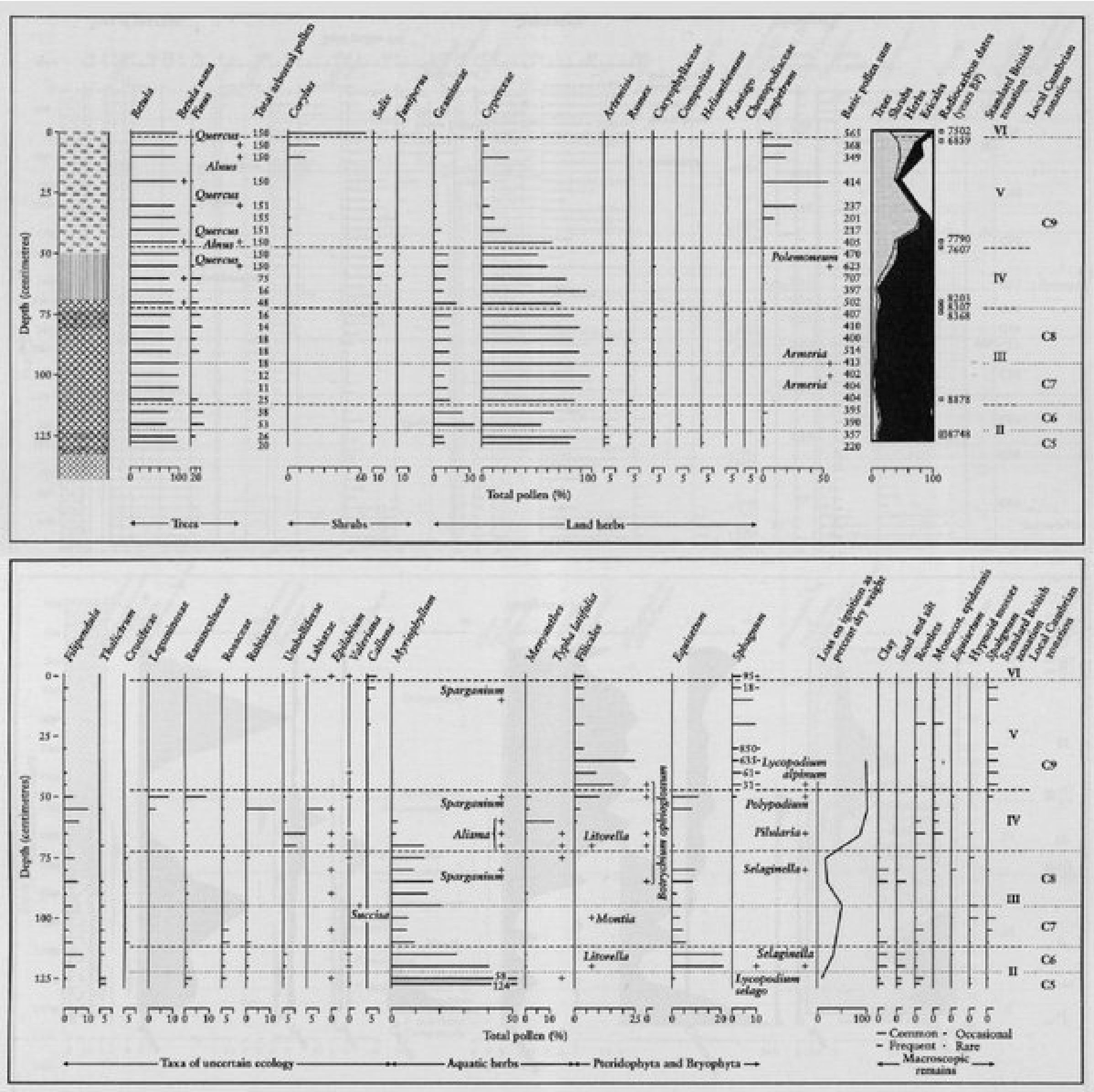
References



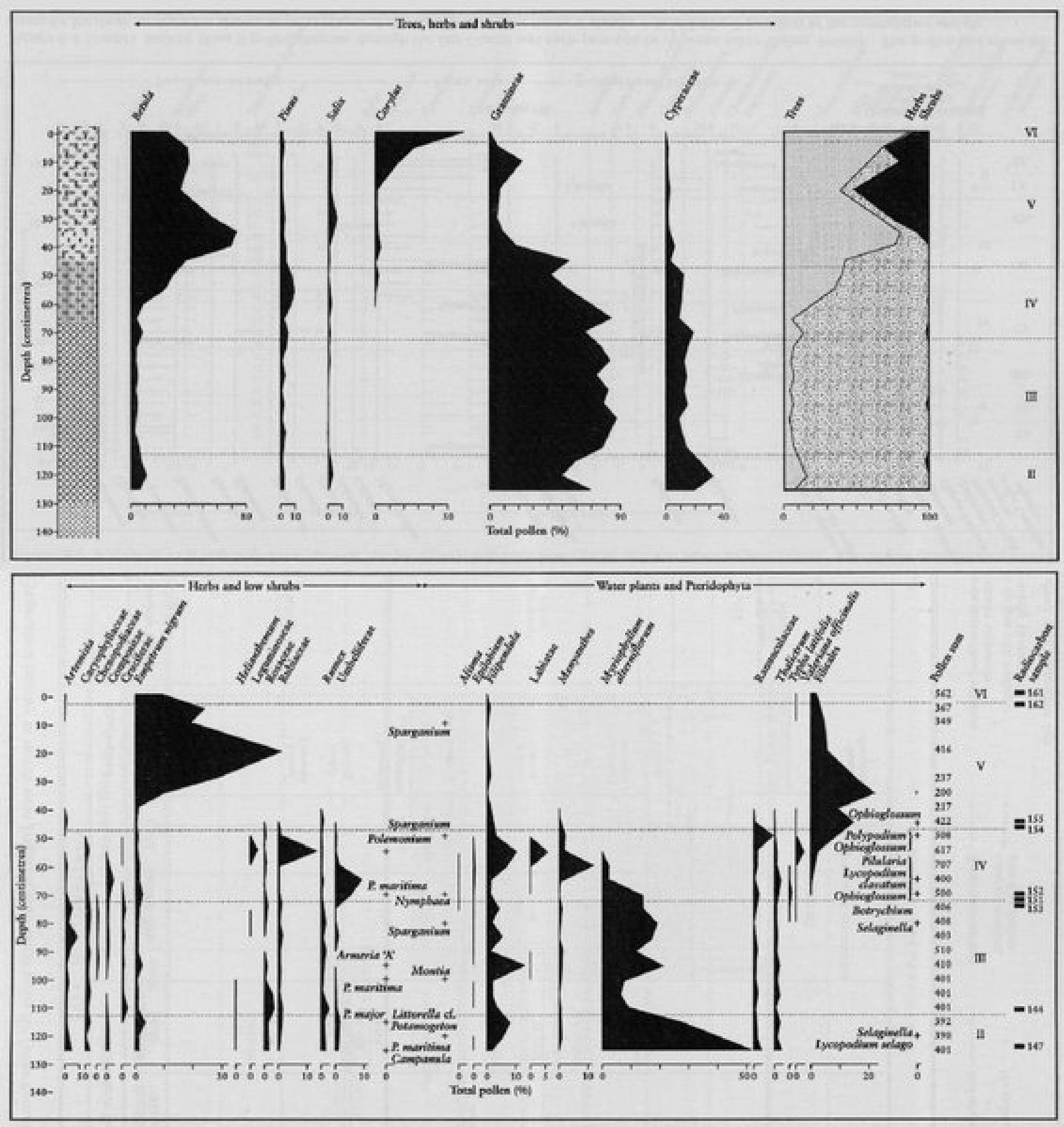
(Figure 8.2) Scaleby Moss, showing its position in a hollow, together with the position of Moorcock Plantation, the series of cores (A–A, B–B) and the remnant of uncut peat (after Walker, 1966b).



(Figure 8.3) Scaleby Moss A pollen diagram through the post-Glacial deposits (after Walker, 1966b). The frequencies of pollen or spores of all taxa are shown as percentages of the arboreal pollen total of the appropriate sample. See (Figure 8.1) for key to the stratigraphical log. Scaleby Moss A pollen diagram through the post-Glacial deposits (after Walker, 1966b).



(Figure 8.4) Scaleby Moss B pollen diagram through the late-Glacial and early post-Glacial deposits (after Walker, 1966b). The pollen frequencies for trees are shown as percentages of the arboreal pollen total of the appropriate sample. The pollen and spore frequencies in the other sections are shown as percentages of the basic pollen sum (trees + shrubs + land herbs + Ericales) of the appropriate sample. See (Figure 8.1) for key to the stratigraphical log.



(Figure 8.5) Scaleby Moss C pollen diagram from samples at 5 cm intervals through the bottom 1.25 m of the peat monolith (after Godwin et al., 1957; Walker, 1966b). All pollen frequencies plotted as percentages of total pollen of dry-land plants excluding ferns. The main pollen-zones have been identified from the changes in vegetation. See (Figure 8.1) for key to the stratigraphical log. (Figure continued on opposite page.) (Figure 8.5) (contd) Scaleby Moss C pollen diagram from samples at 5 cm intervals through the bottom 1.25 m of the peat monolith (after Godwin et al., 1957; Walker, 1966b). All pollen frequencies plotted as percentages of total pollen of dry-land plants excluding ferns. The main pollen-zones have been identified from the changes in vegetation, and the radiocarbon samples were taken at the zone boundaries at the levels shown on the right of the diagram.

Sample number	Depth related to pollen diagram B or C (cm)	Pollen zonation	Age (years BP)
Q172	67.0–69.0 B	Zone VII*b* base	5030 ± 119
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Q162	3.5–5.5 C	Zone V top	8859 ± 192
Q155	44.5–46.5 C	Zone V base	9790 ± 183
Q154	46.5–48.5 C	IV/V boundary (Pre-boreal/Boreal transition)	9607 ± 209
Q152	69.5–71.5 C	Zone IV base	10 203 ± 193
Q151	71.5–73.5 C	III/IV boundary (Post-glacial/Late-glacial transition)	10 307 ± *c.* 350
Q153	73.5–75.5 C	Zone III top	10 368 ± 215
Q144	109.5–111.5 C	Zone III base	10 878 ± 185
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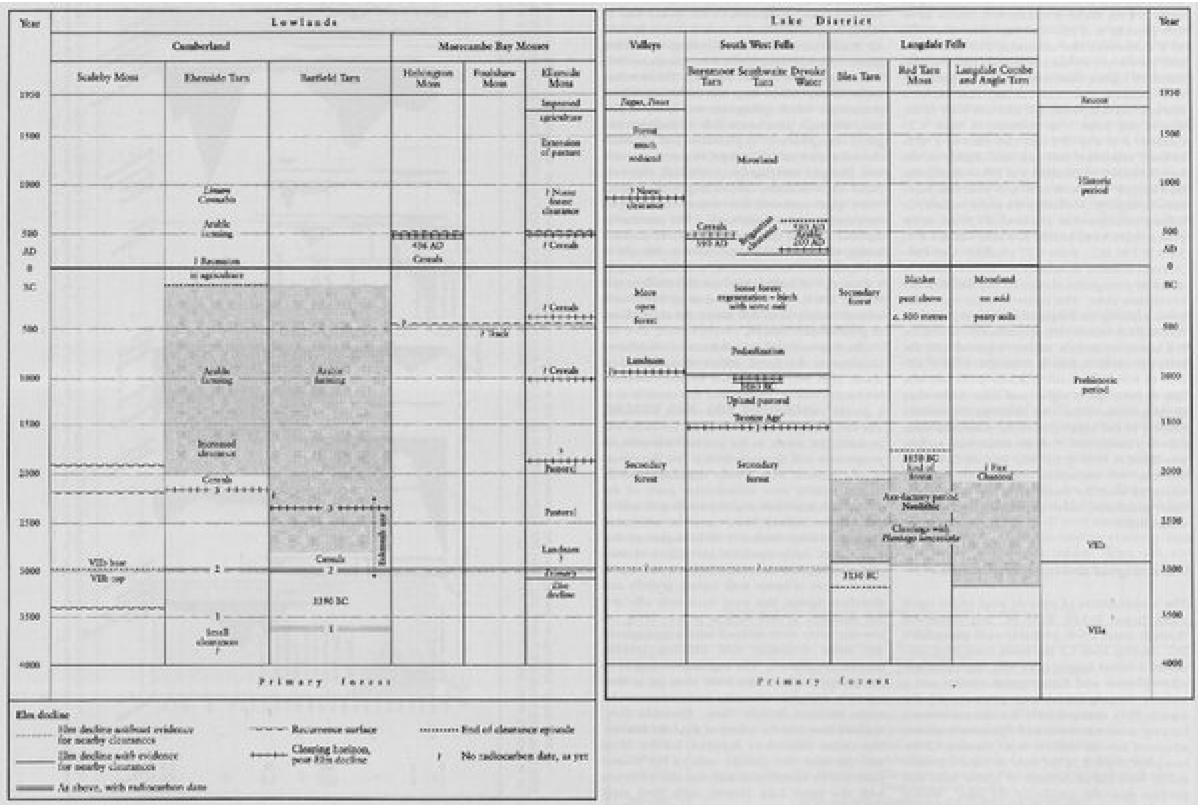

(Table 8.2) Vegetation history in north-west England after 6000 years BP (after Pennington, 1970)