Scandal Beck

[NY 742 024]

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Introduction

Exposures in the bank of Scandal Beck, a tributary of the River Eden, reveal a complex Quaternary stratigraphical succession. The succession has been described as either a series of interglacial organic lake muds with some of the peat having been incorporated into an overlying till (Carter *et al.,* 1978), or organic sediments that are included in a lower sandstone-rich till, overlain by a limestone-rich till, providing evidence for two glacial events (Letzer, 1978, 1981).

This is an important and unique site for northern England, as evidence of possible glacial events before the Late Devensian is rarely preserved in this region. The site is defined as the stratotype of the Scandal Beck Bed (Thomas, 1999). The bed is not related to any other formal lithostratigraphical unit but is thought to be related to organic sands at Low Hurst (Evans and Arthurton, 1973; Thomas, 1999) ascribed to an Ipswichian age (Oxygen Isotope Stage 5).

Description

Scandal Beck, in Cumbria, is a small tributary stream in the upper Eden valley near the interfluve area with the Rawthey drainage, at an altitude of 275 m OD. The site lies on the southern edge of the Vale of Eden drumlin field, with a number of these glacial bedforms occurring near the site (Figure 4.20) (Letzer, 1978, 1987). Recent fluvial erosion has led to a number of small landslides in the west bank of the stream near Brunt Hill Farm revealing the stratigraphy (Figure 4.21) (Carter *et al.,* 1978). Sections described in 1969 indicate 4 m of till overlying 2 m of fluvial sediments with organic lenses and with more notable peat layers towards the base (Carter *et al.,* 1978). Further work in 1972 involved augering the stream bed, when the sequence was extended a further 2 m in depth, revealing more beds of clay with interstratified peat and a base of dark clay, but no till. Samples for pollen analysis were taken on both occasions, although the published diagrams are ambiguous with respect to stratigraphical location (Carter *et al.,* 1978).

Field observations by Letzer in 1976 and in 1981 revealed a more complex stratigraphical succession (Figure 4.21). Observations noted the incorporation of clasts of peat into a till, the deformation of the organic sequence and the presence of two tills above the peat (Letzer, 1978). Subsequent investigations (Letzer, 1981) indicated the presence of a lower till probably extending below the peat ((Figure 4.21)b). A field excursion in 1988 re-examined the site and although exposure was poor, sheared organic material in the sand and clay sequence was observed overlain by two distinct tills (Rose and Mitchell, 1989). No evidence was seen of the lower till.

Attempts were made to obtain radiocarbon age estimates from samples of the lower exposed peat (Shotton *et al.,* 1970; Shotton and Williams, 1971). Two dates were obtained; the first, after alkali pre-treatment, gave a date of 36 300 + 2100/ −1700 years BP, whereas an infinite date of >25 000 years BP was obtained after humate extraction (Shotton *et al.,* 1970; Carter *et al.,* 1978). A further sample from a wood fragment in the upper organic layer give a date of >32 500 yrs BP (Shotton and Williams, 1971). Little confidence can be placed in these dates and the section clearly needs to be revisited and sampled for new material.

Interpretation

Pollen analysis of the exposed succession allowed the identification of three local pollen assemblage zones that are thought to be typical of the closing stages of an interglacial (Carter *et al.,* 1978). The lowermost zone contains high values of *Quercus* pollen with other thermophilous woodland species. The middle zone contains high percentages of *Alnus* and the presence of water plants such as *Nuphar* and *Nymphaea* indicates wetter conditions. The upper zone is dominated by *Pinus* and indicates a boreal, rather than temperate, climate thought to indicate climatic cooling (Carter *et*

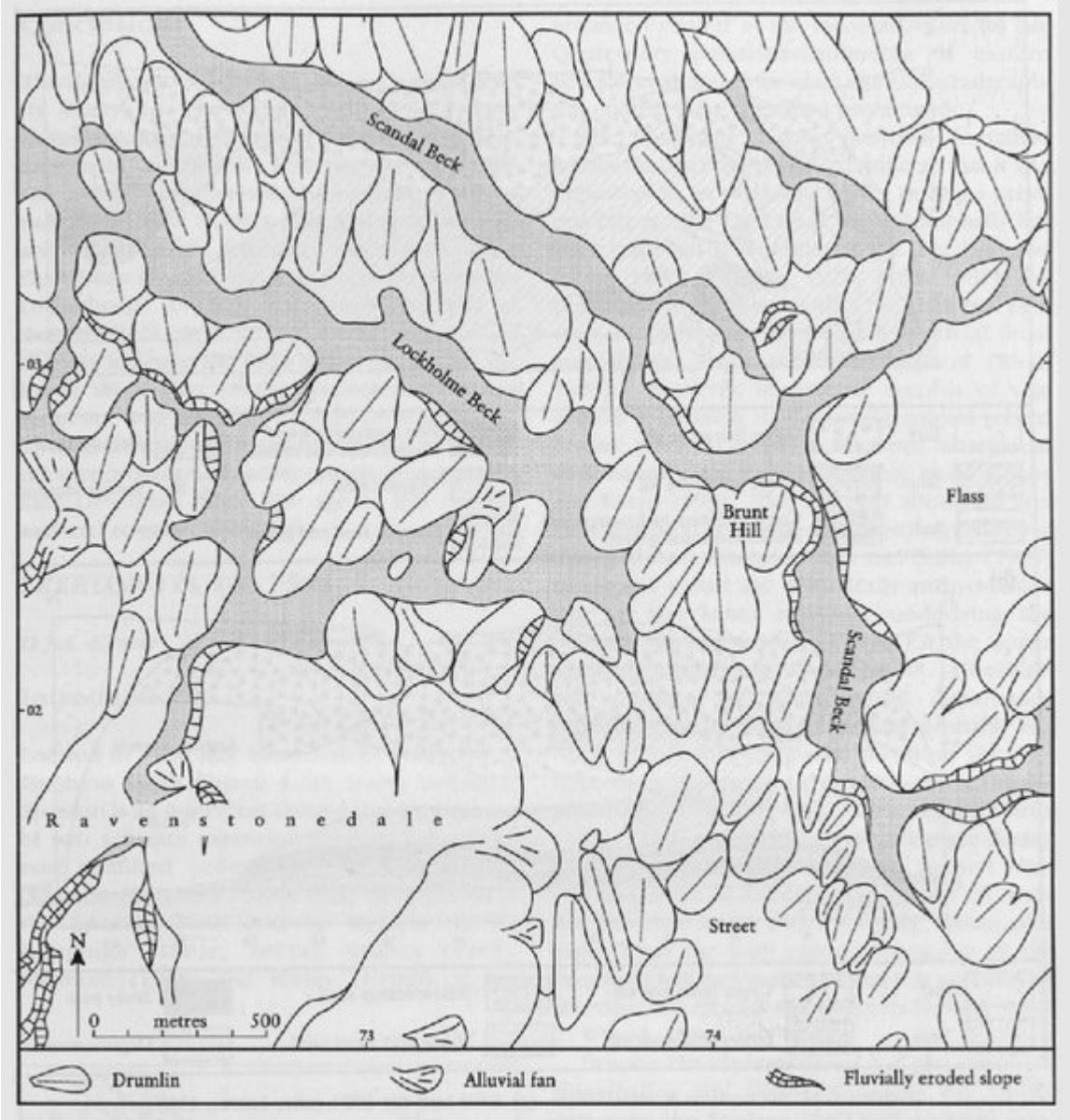
al., 1978). The general pattern and the presence of *Carpinus* pollen with *Alnus* in pollen assemblage zone ScB-2, is thought to correlate Scandal Beck with Zone III of the Ipswichian interglacial (Carter *et al.,* 1978). A further series of samples taken from the stream-bed gave a similar pollen signal from sediments that were thought to underlie stratigraphically the riverbank exposures. This repetition of the pollen assemblages is interpreted as the result of glacial overthrustWing of the sequence, although it may reflect an interglacial climatic sequence that was much more complex with a series of climatic oscillations (Carter *et al.,* 1978).

The basal grey till underlying the organic sed iments in 1981 and interpreted by Letzer (1981) as the same lower grey till that was seen above the organic sediments in 1976 is explained by glaciotectonic thrusting of the sediments. This has led to a thickening of the sediment sequence and a repetition of the lithological units. This is confirmed by the repetition of the pollen bio-zones and suggests that glaciotectonic disturbance, rather than complex interglacial climatic fluctuations, is the preferred interpretation (Carter *et al.,* 1978).

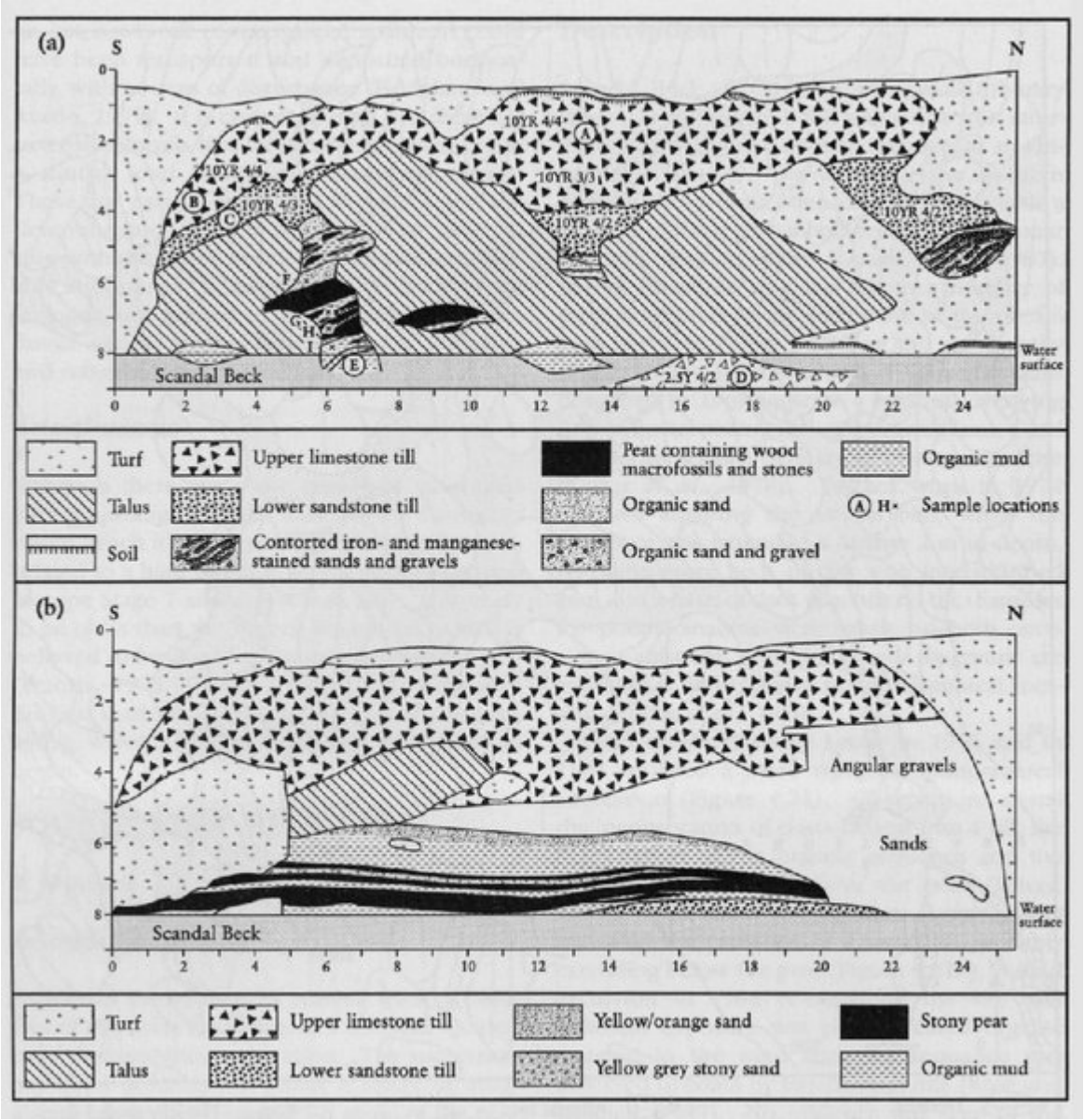
Conclusions

The significance of this site was due originally to its rarity in providing evidence for pre-Devensian glacial events in northern England. Exposures of older tills, however, are controversial owing to problems in dating them. Thus, in the eastern Lake District, a deeply weathered till and associated palaeosol underlies Late Devensian till, but the age is far from certain (Boardman, 1985c). Although the site at Scandal Beck gives stratigraphical evidence to suggest a lower till, it is more likely that the lower till is part of the glaciotectonic thrust sequence and therefore of Late Devensian age. The significance of the site therefore is related to the incorporation of earlier organic material into Late Devensian tills. The age of this organic material remains uncertain.

References



(Figure 4.20) Geomorphological map of the area showing the position of the Scandal Beck site within the drumlin field. (After Letzer, 1978).



(Figure 4.21) Sections in Scandal Beck: (a) 1976 and (b) 1981 (after Letzer, 1981).