Mere Sands Wood

[SD 448 157]

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Introduction

Mere Sands Wood provides the best exposures of an extensive (200 km^2) periglacial aeolian deposit (coversand) in south-west Lancashire (Figure 8.16) (Godwin, 1959; Tooley and Kear, 1977; Wilson *et al.,* 1981; limes *et al.,* 1989; Bateman,1995). The coversands are of Late Devensian age and referred to as the 'Shirdley Hill Formation' (Thomas, 1999). The thick coversands provide evidence for aeolian sedimentation during the Late Devensian, and are overlain by a complex sequence of Holocene sands, and organic sand and muds that have yielded palaeoecological remains (Baxter, 1983; Tooley, 1985; Innes *et al.,* 1989; Middleton *et al.,* 2001). Travis (1909) and Gresswell (1953) first described the Shirdley Hill Formation, with the Mere Sands Wood sequence first investigated by Tooley and Kear (1977) and Tooley (1985). The site subsequently featured in studies by Wilson *et al.* (1981), Baxter (1983), Innes *et al.* (1989) and Bateman (1995).

Description

Mere Sands Wood SSSI is 10 km east of Southport in south-west Lancashire, and is located within the boundaries of the Mere Sands Wood Nature Reserve. Mere Sands Wood is near the edge of a formerly extensive (6 km by 3 km) low-lying (2.7–3.4 m OD) freshwater lake, Martin Mere, drained at the end of the 17th century. Sand was extracted at Mere Sands Wood until 1982, when the Lancashire Wildlife Trust acquired the site and flooded the pits to create the Nature Reserve. Sections in the sand-pits reveal Shirdley Hill Sands underlying a sequence of Holocene organic sediments (Tooley and Kear, 1977). The stratigraphy is listed in (Table 8.8).

Interpretation

Gresswell (1957) identified a mid-Holocene shoreline (6000–5000 years BP) near the Lancashire coast, which was referred to as the 'Hillhouse Coastline'. The Shirdley Hill Formation (unit 1, (Table 8.8)) was identified as relict beach sands associated with this coastline, but re-evaluation of the evidence has radically altered this palaeoenvironmental interpretation. The Shirdley Hill Formation is typically less 1 m but locally can exceed 5 m in thickness, and these sands form a discontinuous cover over Kirkham Formation Devensian glacial sediments (Thomas, 1999). Godwin (1959) identified that the Shirdley Hill Formation overlay Windermere interstadial organic sediments and were covered by earliest Holocene organic muds and peat at Moss Lake in Liverpool. Godwin suggested the sands were deposited by aeolian processes forming coastal dunes during the Late Devensian. Kear (1977) used the uniform particle-size distribution of the Shirdley Hill Formation to indicate an aeolian origin, and suggested that the sediments were derived from local glaciofluvial material. The cryoturbation features that characterize the basal Shirdley Hill Formation also indicate a cold periglacial climate and suggest that the sands accumulated during the Late Devensian (Tooley, 1985).

(Table 8.8) Stratigraphy at Mere Sands Wood (after Baxter, 1983; Tooley, 1985; Wilson, 1985; Bateman, 1995).

Unit	Depth (cm)	Lithology
9	0–90	Mere Sands (Wilson, 1985)
8	90–98	Sandy substantia humosa
7	98–105	Fine detrital mud
6	105–139	*Turfa herbaceae*
5	139–140	*Turfa menyanthis*
4	140–141	Fine detrital mud

3	141–157	Fine–sandy detrital mud and *Turfa herbaceae*
2	157–160	Fine detrital mud and *Turfa herbaceae*
1	160– Locally up to 5 metres thick	Shirdley Hill Formation: loose fine to medium moderately to moderately well sorted sands displaying weak cross-bedding and cryoturbation structures

Wilson *et al.* (1981) used particle-size analysis, scanning electron microscopy of quartz grains and structures in the sediments at Mere Sands Wood to confirm an aeolian origin for the Shirdley Hill Formation. Mineralogical analyses of unweathered Shirdley Hill Formation and several different potential source materials demonstrate that the coversands closely resemble glaciofluvial sediment. Wilson *et al.* (1981) suggested that the Shirdley Hill Formation consists of wind-blown sands derived from outwash sediments left by the Devensian ice sheet. Bateman (1995) correlates the Shirdley Hill Formation with the European coversand chronology presented by Koster (1988) using three thermolu-minescence (TL) dates for the sequence at Mere Sands Wood (Figure 8.16). The TL dates on quartz grains confer an age of 11 730 ± 1510 years ago on the upper 20–30 cm of the Shirdley Hill Formation. A ^{14}C date of 10455 ± 100 years BP on organic sediments overlying the Shirdley Hill Formation at Clieves Hill, 10 km south-west of Mere Sands Wood, constrains deposition of the Shirdley Hill Formation to the Late Devens-ian. Two further TL dates on sand yielded ages of 8740 ± 2060 years BP and 6940 ± 1110 years BP, which are at equivalent depths to units 3 and 7–8 respectively (Bateman, 1995).

The organic sediments at Mere Sands Wood reflect the accumulation of plant-rich detritus and peat in an aquatic to peatland environment on the edge of Martin Mere (Tooley, 1985). Pollen diagrams (Figure 8.17) have been produced for the organic sediments that overlie the Shirdley Hill Formation (Baxter, 1983; Tooley, 1985). The pollen succession in units 2, 6, 7 and 8 overlying the Shirdley Hill Formation is an early Holocene sequence (Figure 8.17). *Betula, Pinus* and *Populus* dominate units 2 and 6 before declining as *Quercus, Ulmus* and then *Alnus* increase in abundance to dominate units 7 and 8 (Baxter, 1983; Tooley, 1985). The palynology indicates that organic sedimentation began at the beginning of the Holocene Epoch, a view supported by a ^{14}C date of 10 455 ± 100 years BP on equivalent organic sediments at Clieves Hill. Organic sedimentation ceases shortly after the *Alnus* rise (unit 7), which is ^{14}C dated at Red Moss to 7107 ± 120 years BP (Hibbert *et al.,* 1971).

The organic sediments are covered by a further sequence of sands, the Mere Sands (Wilson, 1985), and three explanations exist for the sand's origin and mode of deposition.

1. Lacustrine sands derived from glaciofluvial material and the Shirdley Hill Formation (Crompton, 1966).
2. Wind-blown reworked Shirdley Hill Formation (Tooley and Kear, 1977).
3. Wilson *et al.* (1981) found that the Mere Sands differed substantially from the Shirdley Hill Formation and had a greater affinity with modern beach and dune material on the Lancashire coast.

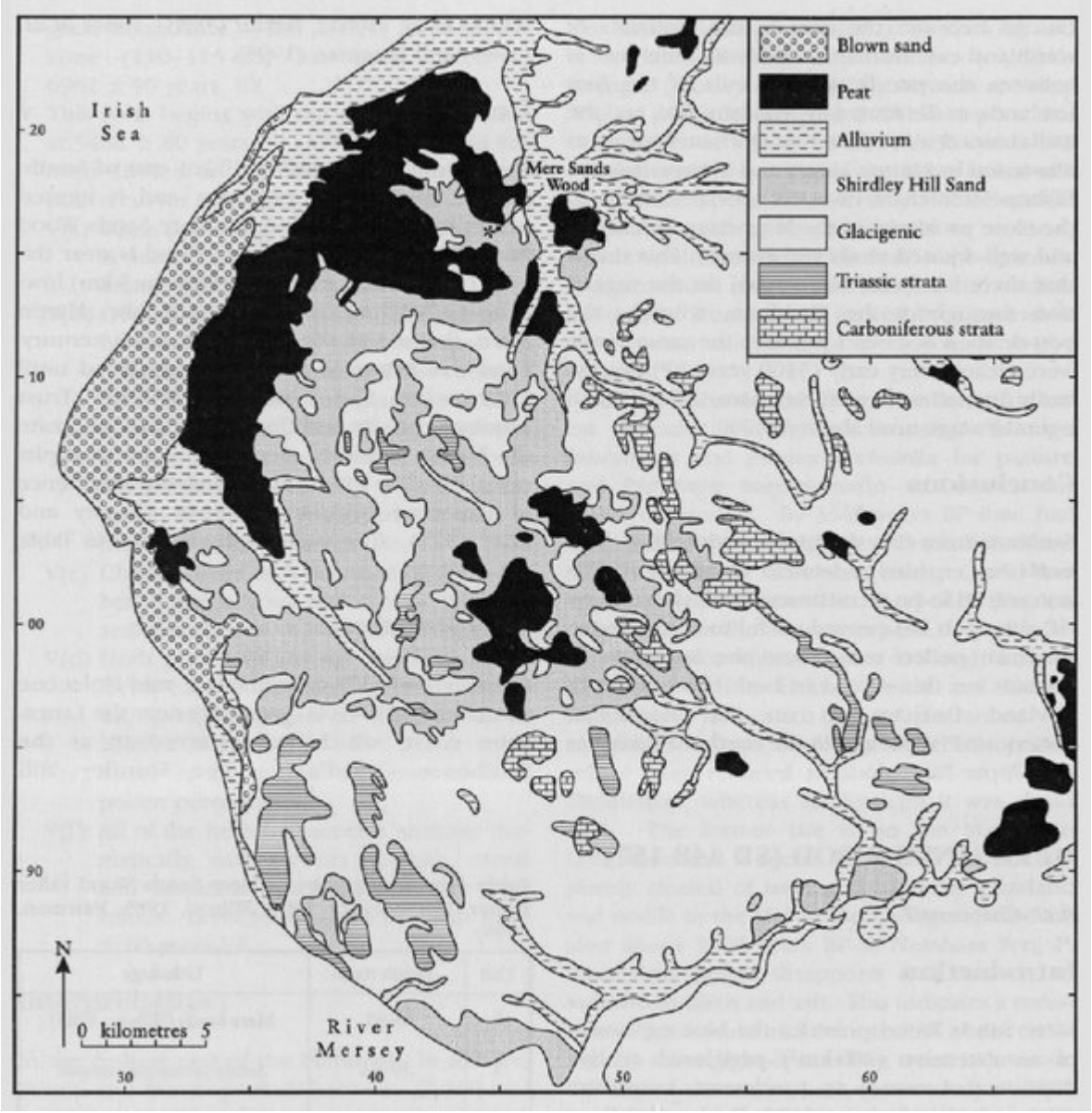
The pollen spectra in units 4–5 are out of sequence, containing abundant *Quercus, Ulmus* and *Alnus* before the early Holocene expansion of these species. Tooley (1985) invokes a scenario with units 3–5 (2.5–2.6 m OD) deposited when unit 6 was floated up as Martin Mere expanded as a freshwater lake. There is evidence for a similar event affecting altitudes of 3.1–3.2 m OD at Tarlscough Moss, a peat sequence on the edge of Martin Mere (McAllister, 2001). The timing for this floating is uncertain, although it has been correlated with higher lake levels in Martin Mere forced by higher local water tables during marine incursions dated to 6890 ± 55 and 6790 ± 95 years BP at Downholland Moss (Tooley, 1974, 1978a, 1985; Huddart, 1992). Organic sedimentation at Mere Sands Wood ceases around 7000 years ago.

Conclusions

Mere Sands Wood is an important reference site for studies of the Shirdley Hill Formation, and for elucidating the geomorphology and environmental history during the Late Devensian and the Holocene in south-west Lancashire. Mere

Sands Wood is a former pit from which sand was extracted for glass making up until 1982, when the site was flooded to form the present nature reserve. Currently there is little exposure of the stratigraphy owing to the flooding and natural degradation of the faces. Trenching of drainage ditches reveals the organic sequence and the uppermost metre of the Shirdley Hill Formation. Nevertheless Mere Sands Wood offers some of the best exposures of the Shirdley Hill Formation. The sands were reworked by aeolian processes from glaciofluvial sediments under a periglacial climatic regime during the Late Devensian. This Late Devensian periglacial coversand is luminescence dated to 13240–10220 years BP and is analogous to the Younger Coversand II in the European chronology (Koster, 1988; Bateman, 1995). The palaeoecology of the organic sediments provides useful information about the early Holocene in southwest Lancashire.

References



(Figure 8.16) Surface geology of south-west Lancashire, showing the distribution of Shirdley Hill Sand (from Wilson et al. 1981).

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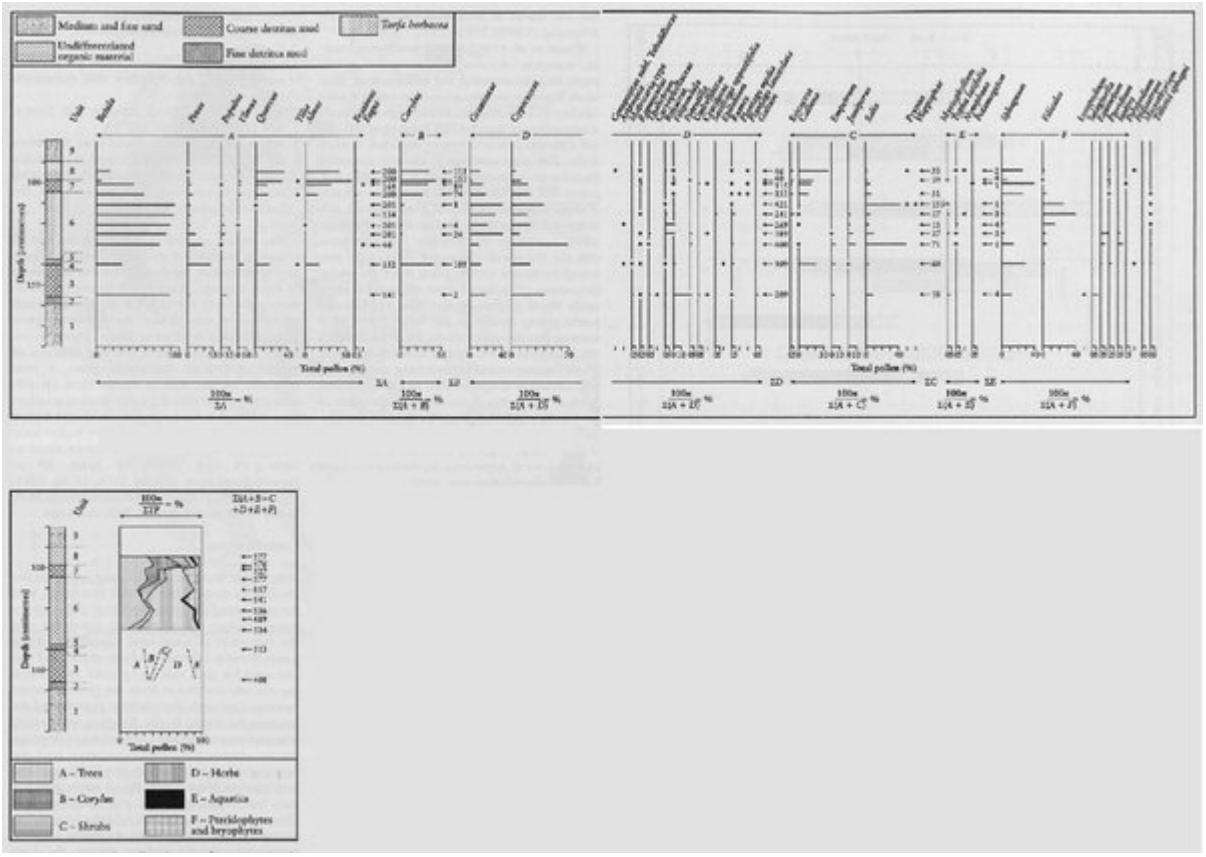

(Figure 8.17) Pollen diagram from Mere Sands Wood (after Tooley, 1985).