Bourne

C.O. Hunt

Highlights

Bourne shows an excellent example of ancient interglacial soil formation, periglacial aeolian deposition and mass movement on the older alluvial fan deposits of Mendip. Well-developed palaeosols have been reported extremely rarely in South-West England. The site is the type-section for the Burrington Member and the Burrington Palaeosol.

Introduction

At Bourne, deposits of the alluvial fan at the mouth of Burrington Coombe were exposed in temporary sections. A basal gravel unit, the Havyat unit, contains in its upper part a 'weathered horizon' — a soil profile with characteristics indicating pedogenesis in interglacial conditions. This is overlain by a second gravel body, the Ashey unit, which probably dates from the Devensian.

Gravel deposits along the foot of the Mendips have been known since the work of Woodward (1876) and Morgan (1888). Modern work started with the work of Clayden and Findlay (1960), Green and Welch (1965) and Findlay (1965) and has recently included the morphological work of Pounder and Macklin (1985). Gravels were first described from Bourne by Woodward (1876), who described 5 feet of sandy angular to subangular gravel in a roadside exposure. Findlay (1977) described the section at Bourne in detail, and suggested it showed evidence for a major episode of fluvial deposition and two phases of aeolian sedimentation separated by a phase of pedogenesis of interglacial status. Pounder and Macklin (1985) described the morphology of the fan deposits. They recognized four phases of aggradation, the Langford (oldest), Havyat, Ashey, and Link Lane units (Figure 9.18). Campbell *et al.* (in prep.) proposed the site as the type-section of the Burrington Member (Oxygen Isotope Stage 6) and the Burrington Palaeosol (Stage 5).

Description

Bourne GCR site lies at the eastern end of the Churchill–Burrington–Rickford alluvial fan complex, the morphology of which was described by Pounder and Macklin (1985). In temporary sections at [ST 483 598], over 3 m of Quaternary deposits were exposed in the Ashey and Havyat units defined by Pounder and Macklin (1985). The following description is modified from that given by Findlay (1977) (maximum bed thicknesses in parentheses):

9. Dark brown, sandy silt loam topsoil. (0.15 m)

8. Brown and reddish-brown, slightly stony sandy silt. The clasts in this bed are mostly of sandstone with some of chert. Tongues or wedges containing material similar to the deposits in this bed extend from its base downwards into the underlying beds. (0.20 m)

7. Reddish-brown, slightly stony clayey silt passing down into a sandy clayey silt. The clasts are mostly sandstone with some chert. (0.30 m)

6b. Reddish-brown and red clay, with 20% black manganiferous mottle. The bed occurs as discontinuous lenses and merges with bed 5 when bed 6a is absent. (0.15 m)

6a. Yellowish-red to reddish-brown sandy silt. The bed occurs as discontinuous lenses. (0.20 m)

5. Reddish-brown and red very stony clay, with 20% manganiferous mottle on ped faces and stones. The clasts are mostly sandstone with some chert. When bed 5 is absent, this bed merges with bed 6 with decreasing black staining. (0.20 m)

4. Yellowish-red to reddish-brown sandy silt with layers of reddish-yellow silty sand, with occasional sandstone and chert cobbles and small boulders. The bed has sharp upper and lower boundaries and occurs as discontinuous lenses which attenuate downslope. (0.50 m) Reddish-brown very stony clay. The clasts are predominantly sandstone with some chert and quartz. A wide range of clast sizes up to 250 mm is present and the clasts vary from round to subangular. In thin-section, the matrix of the bed can be seen to comprise almost entirely illuvial clay. There is a clear but highly undulating lower boundary to the bed. (0.75 m)

2. Reddish-brown to dark reddish-brown, very stony, sandy clayey silt. The clasts are predominantly of Carboniferous Limestone, with some sandstone and a little chert. In the top 0.3 m of this horizon, Carboniferous Limestone clasts are largely decalcified and surrounded by black clay. This bed passes gradually into bed 1. (0.55 m)

1. Loose, clast-supported cobbly gravel with gritty matrix. Base unseen. (> 0.20 m)

Interpretation

Beds 1 and 2 contain lithotypes derived from the Mendip Hills, including Carboniferous Limestone, Old Red Sandstone and Carboniferous chert, but contain no far-travelled material. The 'gravels' lie at the margins of the Churchill–Burrington–Rickford alluvial fan, which is well known from the work of Woodward (1876), Findlay (1965) and Pounder and Macklin (1985). There is no reason to interpret them as other than gravels of an alluvial fan. Clayden and Findlay (1960) and Macklin and Hunt (1988) have linked deposition of similar alluvial fan gravels around Mendip to short-lived fluvial flood events during stadial episodes in the Pleistocene.

Findlay (1977) suggested that bed 3 was a palaeosol which formed shortly after the deposition of the alluvial fan gravels of beds 1 and 2. The evidence for this includes the high incidence of illuvial clay in the bed, the 'clear but highly undulating' boundary between beds 2 and 3 … so typical of weathering limestone materials' (Findlay, 1977; p. 24), and the decalcified higher part of bed 2. A weathering episode of considerable intensity, probably of interglacial status, would be needed to form a palaeosol of this type.

Silty sand and sandy silt deposits very similar to bed 4 have been widely reported around the Avon lowland as 'coversands' of relatively local aeolian origin laid down during periglacial phases (Gilbertson and Hawkins, 1978a). A similar origin can be suggested for this bed. Findlay's (1977) section appears to show that bed 4 had become disrupted by loading, with the underlying bed 3 being partially displaced. The most likely explanation is that these beds were deformed by mass-movement processes during a periglacial phase. Beds 5, 6a and 6b may represent material partially reworked from beds 3 and 4 at this time. They may, alternatively, reflect further phases of soil formation (bed 5), aeolian coversand deposition (bed 6a) and soil formation (bed 6b). Further research is needed to clarify this interpretation.

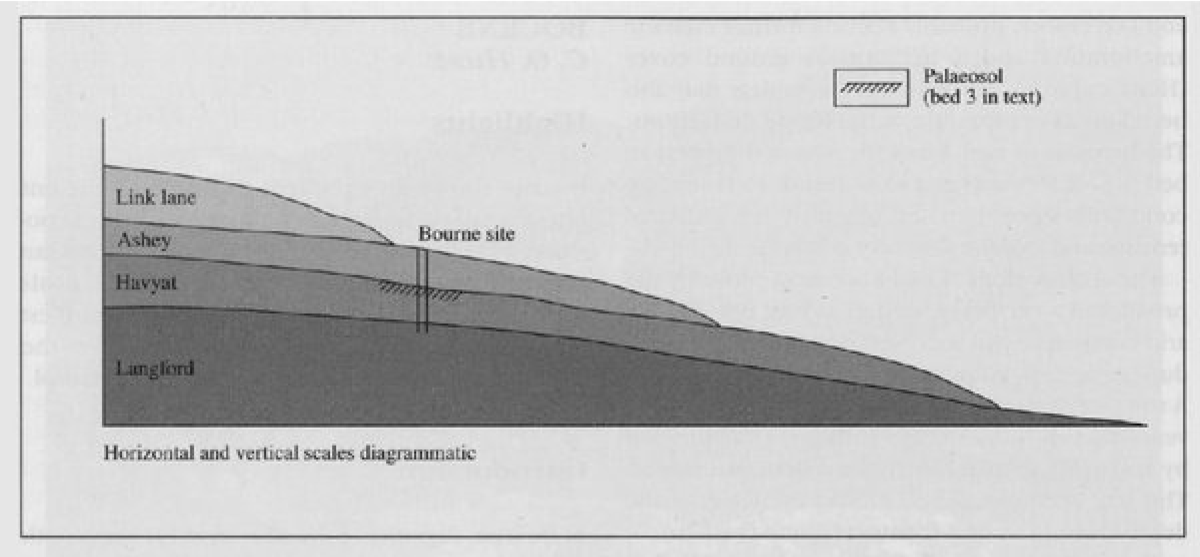
Findlay (1977) suggested that beds 7 and 8 were laid down during a final episode of aeolian silt sedimentation, and later altered by Holocene pedogenesis.

An important though enigmatic sequence can thus be seen at Bourne. The episode of alluvial fan sedimentation can be linked with flash-flood events originating from Mendip during a stadial phase. It was followed by a period of temperate weathering and soil development. This in turn was followed by aeolian coversand sedimentation during a stadial phase and a phase of periglacial mass movement. Other temperate soil-forming intervals and a further coversand depositional event may be represented, but this is by no means certain. Finally, a further episode of aeolian silt sedimentation occurred, again most probably during a stadial episode.

Conclusion

The temporary section at Bourne showed a well-developed palaeosol formed on alluvial fan gravels. Aeolian 'coversand' was then laid down and was subsequently deformed by mass-movement processes before a final phase of aeolian silt sedimentation. The aeolian silt was affected by Holocene pedogenesis. Well-developed palaeosols have been reported extremely rarely in South-West England. Bourne is unusual in providing clear evidence of two phases of aeolian sedimentation.

[References](#)



(Figure 9.18) Schematic cross-section of the Buffington fan at Bourne, showing the aggradational components of the fan and their relationship to the Bourne section. (Adapted from Pounder and Macklin, 1985.)