Beckford, Hereford and Worcester

[SO 978 361]

Highlights

The deposits associated with a river terrace at Beckford provide an important record of palaeo-environmental conditions in the Severn basin, based upon reconstruction of past fluvial and slope processes.

Introduction

Beckford is an important site of Late Devensian slope and adjacent floodplain deposits, which are particularly significant in relation to environmental change in the Severn basin. The deposits here include gravels associated with mass movements and slope wash (Dawson, 1986), and sand which may have been imported by aeolian transport (Briggs *et al.,* 1975). These sediments record transport processes operating under different palaeoenvironmental conditions. A number of reactivation surfaces indicate episodic activity. Downslope, the deposits interdigitate with lithofacies deposited by water flow parallel to the valley axis, marking a transition to the terrace deposits.

Description

The Carrant Valley is cut into the Lower Lias Clay, between outliers of the Cotswold scarp: Alderton, Oxenton and Crane Hills to the south and Bredon Hill to the north. Richardson (1929) suggested that the Carrant Brook originally extended further eastwards, probably being linked to the Isbourne system. Carrant Brook is a small underfit stream in a valley containing extensive terrace deposits (Figure 6.1), which have been related to the terraces of the Avon valley. The main terrace deposits of the Carrant Brook have been dated at 27 650 ± 250 BP (BIRM-293), and those of the Avon No. 2 terrace at between 38 000 ± 700 BP and 26 000 ± 300 BP, placing both in the latter half of the mid-Devensian (Briggs *et al.,* 1975).

Shotton (1968) suggested that the most recent phase of widespread terrace formation took place in the Late Devensian. Between the Upton Warren and Late Devensian interstadials, the rivers had incised their valleys significantly. It is therefore likely that downcutting was at full glacial rather than interstadial times.

Standing 0–15 m above the present floodplain, the Carrant main terrace extends almost continuously along the right bank from near Grafton to Kinsham. On the left bank, it is widespread near Aston on Carrant, and in the Isboume valley at 47 m OD. It has been best exposed at Beckford (Briggs *et al.,* 1975). The exposure now remaining, and forming the focus of the site, does not show the underlying terrace deposits but does show slope deposits, the first sequence studied by Dawson (1986), which overlie the Carrant main terrace, forming the second sequence (Figure 6.2).

The exposure of slope deposits which still exists was studied by Dawson (1986), in relation to exposures nearer the valley centre and further deposits below the present ground surface (Figure 6.1), which are now obscured by standing water. The two distinct sedimentary sequences are composed of gravels and sands. In the first sequence (Association A, (Figure 6.2)), gravels interdigitate with a variety of sandy lithofacies. The gravels on the footslope of Bredon Hill are coarse, poorly sorted and almost wholly of local origin; nearer the river, where they form the basal terrace deposits, they are water-worn, well-bedded, finer gravels and often intercalated with well-sorted sands.

In contrast, the second sequence (Association B, (Figure 6.2)), comprises sands which often truncate these gravels, and are almost wholly different sediments. Briggs *et al.* (1975) considered these to be foreign material, wind-blown from the west. Within the deposit as a whole there is a general downslope transition from the coarse gravel lithofacies.

Three palaeoenvironments of deposition have been suggested for the formation of the terrace (Briggs *et al.,* 1975). Given the small catchment area and the calibre of the material, Briggs *et al*.. (1975) considered that a severe environment must

have existed. They visualized a nival regime with periodic floods and sporadic incursions of soliflucted debris, with negligible aeolian activity. A drier, warmer, westerly airstream then accompanied a reduction in the intensity of solifluction and in stream competence, at about 27 000 BP. Aeolian activity probably imported sands to the area from the west. Later still, aeolian activity ceased and ice wedges developed below the now stable terrace surface. This was followed by the deposition of silty clay loam or head from solifluction material, incorporating traces of aeolian material.

Sediment transport directions have two distinct trends. The gravels indicate north-south transport away from Bredon Hill and towards the valley centre. Some variation may be discerned near the eastern edge of the pit, where fabrics tend to be oriented to the south-east, consistent with the surface morphology. Towards the valley centre, a limited number of sand structures show westward dips, aligned parallel to the orientation of the valley axis, and normal to the transport direction indicated by the gravel fabrics.

Interpretation

The position of the gravel deposit in relation to Bredon Hill, the inclined surface of the deposit and the indicated directions of transport, suggest that the sediments (Figure 6.3) are a form of fan or slope deposit. Although certain structures indicate the existence of flowing surface water, a slope origin is more likely, as the major gravel units are composed of angular clasts, and there is an absence of channels oriented in a downslope direction. Briggs *et al.* (1975) argued for a soliflual origin for these deposits, although processes such as slush avalanching and debris slides cannot be discounted, and slope wash may have been a formative process.

Briggs *et al.* (1975) showed that sands were transported into the area by aeolian processes. At Beckford these have been reworked by fluvial activity. The origin of the extensive beds of planar laminated sand is problematic in that they may be due to separate flood-related sediment pulses (Frostick and Reid, 1977); or they may be partly the product of aeolian deflation and deposition. However, a number of characteristics indicate that they may represent reactivation horizons. Brown (1983c) indicated that the textural uniformity of the alluvium on the terrace and the floodplain suggested that it was a product of high-level flooding of the Carrant Brook, not derived directly from the slopes of Bredon Hill.

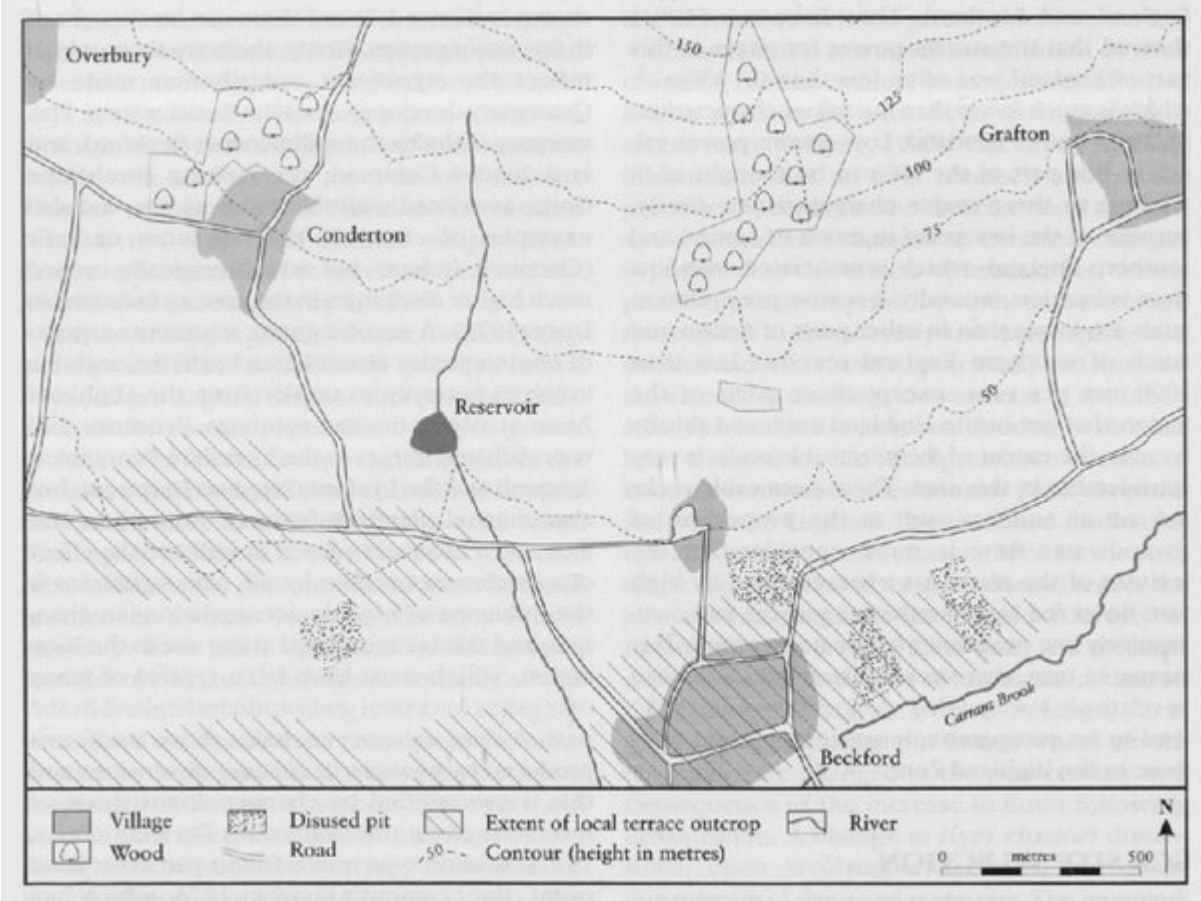
The increasing interdigitation of crudely stratified gravel units with sand lithofacies in a downslope direction seems to have been the result of a change from debris flow to wash-dominated processes. Towards the southern margins of the exposure studied by Dawson (1986), the sandy lithofacies have been extensively reworked, there is interdigitation between beds of planar laminated sand, and cross-stratified lithofacies seem to mark the marginal limits to flow and sedimentation in the valley centre, and to indicate the junction with the valley-side sedimentation represented by the massive gravels and planar laminated sands.

This is an important and unusual site because of the range of types of deposit found and the opportunity that they provide to elucidate the sequence and interrelationships of fluvial, mass-movement and aeolian processes in the mid-Late Devensian.

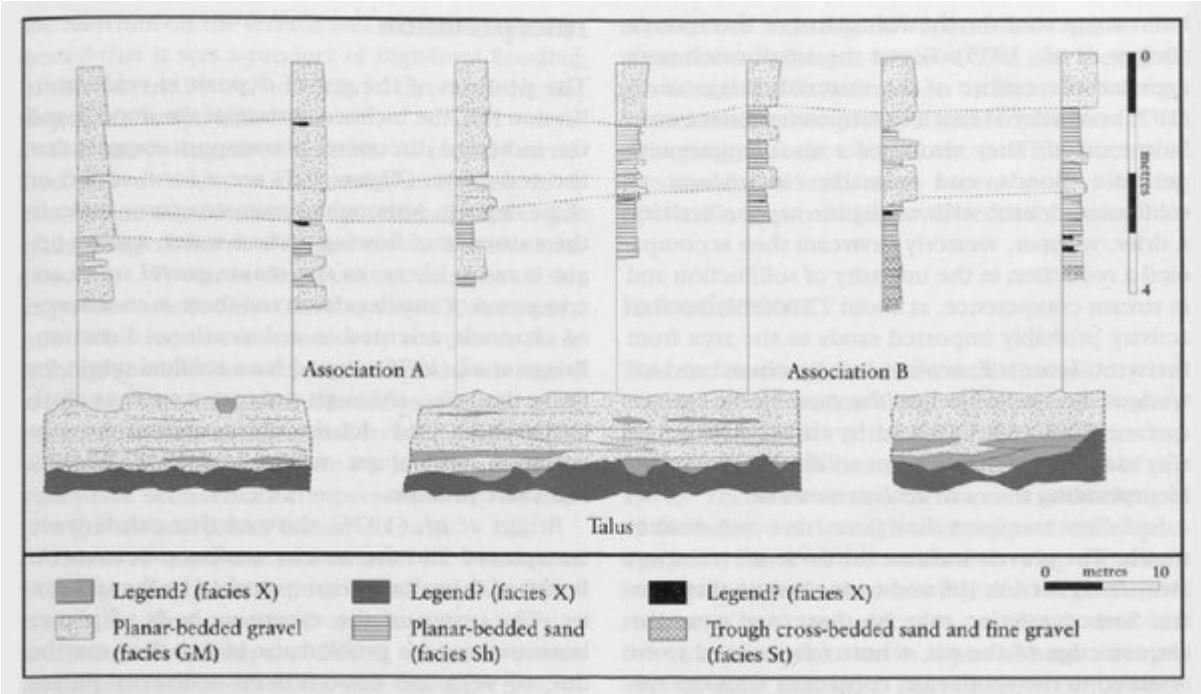
Conclusions

The sedimentary sequence at Beckford is most recently interpreted as the product of slope processes. These seem to have included both soliflual mass movement and slope wash, although much of the sand may initially have been emplaced by aeolian processes. These slope deposits show a number of major reactivation surfaces, indicating that activity on the slope was episodic, although the causes of this are unclear. At its southern margin the slope deposits interdigitate with lithofacies deposited by flow parallel to the valley axis, marking a transition to the terrace deposits. This spatial relationship is rare evidence of processes that are significant during and following the late Devensian in the Severn-Avon basin.

References



(Figure 6.1) The extent of the terrace deposits at Beckford: a map showing the distribution of terrace outcrops in the Beckford area.



(Figure 6.2) Sedimentary sequences at Beckford: vertical sections showing sedimentology and facies associations through terrace. (After Dawson, 1986.)

(Figure 6.3) The exposure of terrace deposits at Beckford. (Photo: R.J. Davis.)