Lightspout Hollow

[SO 435 952]

D. Wilson

Introduction

This site includes a small tributary on the western side of the Carding Mill Brook and the upper reaches of the Carding Mill Valley (Figure 5.15). It falls within the existing Longmynd SSSI and was selected for the GCR because of its exceptional exposures that are designated as the stratotype for the Lightspout Formation. This unit comprises about 500 to 800 m of thinly to thickly interbedded siltstones and sandstones with one or more thin tuff beds in the upper part. Its base is taken at the change from the predominantly purplish red-brown colouration of the underlying Synalds Formation to the greenish grey that typifies the Lightspout Formation, a somewhat arbitrary division, which nevertheless generally occurs at a comparable distance above the Batch Volcanic Beds throughout the region (James, 1956). The colour change is commonly accompanied by a lithological transition, with sandstones noticeably more abundant than in the Synalds Formation. Purple-red colouration re-appears in the upper part of the Lightspout Formation and becomes more persistent towards the top. The top of the formation is taken at the base of the Huckster Conglomerate, a well-defined marker bed that can be traced across most of the Long Mynd (James, 1956; Greig *et a1.,*1968).

The Lightspout Formation is a sequence of fluvial sandstones and siltstones within the middle part of the eastern Longmyndian Stretton Group, and is an important reference to the changing depositional environments of the Longmyndian, when studied in conjunction with other sites in the general area. Although the succession had been described in considerable detail by Murchison (1839), Salter (1857), Blake (1890) and others, the term 'Lightspout Group' was first given by Lapworth and Watts (1910), and the division has been generally accepted by subsequent workers. Significant contributions to the description and depositional environment of the formation have been provided by James (1956), Greig *et al.* (1968) and Pauley (1986, 1990a,b). Dunning (1975) modified the definitions used by Greig, replacing the term 'group' for the more formal designation of Lightspout Formation.

Description

The boundary between the Synalds and Lightspout formations can be readily identified in the numerous crags on the north and south sides of the Carding Mill Valley, where the beds dip steeply westward at 60° to 80° ((Figure 5.15), Locality 1). The accompanying colour change occurs over several metres within the finer-grained lithologies, and the transition is marked by the appearance of flaggy siltstones and sandstones within the Lightspout Formation. The bulk of the formation along the Carding Mill Valley and Lightspout Hollow consists of alternations of silty mudstone and siltstone, with packets of sandstone and sporadic beds of purplish red mudstone and siltstone. The siltstones and silty mudstones are thinly colour banded from pale to dark greenish grey, and commonly contain sandstone laminae and beds up to 20 mm thick. Worn and smoothed surfaces on the paths along Lightspout Hollow and Carding Mill Valley reveal delicate sedimentary structures, including ripple marks, small scours, convolute laminae and sandstone dykes ((Figure 5.15), Locality 4). In other parts of the Lightspout Formation, rill markings and groove casts have been observed (Greig *et al.,* 1968).It was from similar facies that Peat (1984a) obtained a variety of algal microfilaments.

Sandstones occur throughout the Lightspout Formation in this area, in packets up to 10 m thick, interbedded with subordinate thin mudstones and siltstones. They are generally thinly to thickly bedded, fine- to medium-grained, lithic arenites, with a significant Uriconian volcanic detrital component, subordinate quartz and some mica (Greig *et al.,* 1968); in the upper part of Lightspout Hollow, some beds are predominantly tuffaceous. Individual sandstone beds are up to 0.5 m thick, commonly parallel-sided, parallel-laminated and ripple cross-laminated; slightly sinuous ripple marks are visible on the upper surface of some sandstones at Lightspout waterfall (Locality 5) (Greig *et al.,* 1968) and in several loose blocks. Poorly developed trough cross-bedding is discernible on some surfaces (Figure 5.16). Massive or irregularly bedded, medium-grained sandstone beds up to 4 m thick occur in places, first appearing about 30 m above the base of

the formation and then at intervals throughout the succession (Locality 2, 3 and 6). One such bed occurs on the northern side of the Carding Mill Valley (Locality 2) and has been named the Haddon Hill Grit (James, 1956), although it is probably not traceable for any great distance (Greig *et al.,* 1968). Another, outcropping at the waterfall (Locality 5), has been named the Lightspout Grit (Taylor, 1958). A particular feature of many sandstone beds is quartz veining accompanying a strong pressure-solution cleavage along which the quartz is concentrated.

In the upper part of the formation, at the head of Carding Mill Valley, the strata revert to the dull purplish red-brown colour more typical of the underlying Synalds Formation (Locality 7). The colour change is gradual, and initially affects only the finer-grained lithologies. The highest beds are entirely purplish red, consisting of alternations of siltstone and coarse-grained sandstone and a coarse purple tuff, which is seen as debris along the path beside the Carding Mill Brook (Locality 8) (Greig *et al.,* 1968). The Huxter Conglomerate, defining the top of the formation, is only locally present in this area, being represented by small exposures of a massive, purplish red coarse-grained sandstone with scattered pebbles of quartz and red siltstone, about 350 m above the waterfall in Lightspout Hollow (Locality 9).

Interpretation

The Lightspout Formation records a continuation of the fluvial sedimentation that began with the deposition of the Synalds Formation. A similar range of subaerial and shallow water sedimentary structures is displayed in the siltstones and mudstones of both formations, although the Lightspout Formation contains the additional component of thicker, laterally extensive and more abundant sandstone units, reflecting the overall coarsening-upwards trend that occurs throughout the Longmyndian. These multistorey sandstone packets are thought to have been deposited predominantly by successive major unconfined sheet floods under high flow regimes (Tunbridge, 1981; Pauley, 1990a,b); ripple marks record waning flow conditions and reworking of the tops of the sandstone beds. Bed thickness variations between successive bundles of sandstones may reflect their relative proximity to the point of discharge, rather than the magnitude of individual flows.

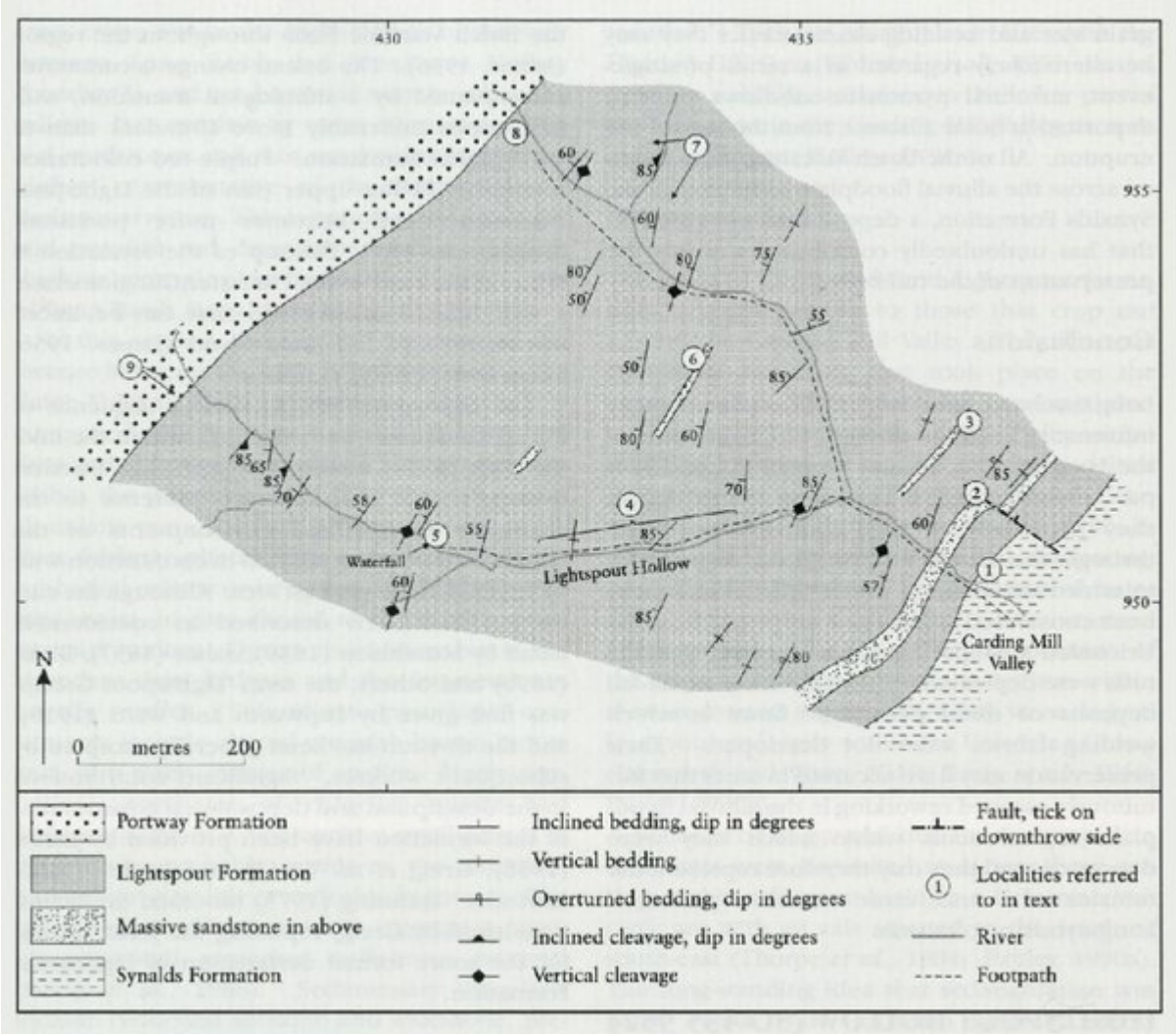
The laminated siltstones and mudstones were probably deposited from suspension, during periods of low flow towards the end of each flood event. The small groove casts and scours sometimes seen in these deposits are presumably caused by erosion of the cohesive sediment by the succeeding flow. Palaeocurrent analyses of these and other structures by Pauley (1990a) indicated sheet floods that discharged in a west to WNW direction. Rapid sediment loading by successive flows was probably responsible for the small convolutions and injection structures seen in some of the laminated siltstone–mudstone sequences.

The massive, thick sandstones that occur sporadically throughout the Lightspout Formation, and some trough cross-bedded units, probably represent shallow channels (Pauley, 1990b), although some may represent flood deposits of unusual magnitude; there is no evidence to suggest that they are laterally accreted channel fills. However, the thick, coarse-grained, trough cross-bedded sandstones that appear in places in the upper part of the Lightspout Formation have been interpreted as braidplain deposits, representing incursions of this facies onto the alluvial floodplain as the fluvial system prograded north-westwards (Pauley, 1990a,b). A major advance of the braidplain occurred with the deposition of the widely developed Huxter Conglomerate, immediately succeeding the Lightspout Formation.

Conclusions

The excellent exposures along Lightspout Hollow and Carding Mill Valley provide the stratotype for the Lightspout Formation, a unit representing the younger part of the alluvial plain sedimentary facies that characterized Longmyndian Supergroup deposition during the late Precambrian. The site is highly instructive for sedimentologists since it demonstrates an upward evolution, from strata deposited as a result of sheet-flood activity to sequences indicative of alluvial braidplain environments. In conjunction with other GCR sites nearby, the site emphasizes the range of fluvial sedimentary environments that existed during deposition of the Eastern Longmyndian of Shropshire.

References



(Figure 5.15) Geological map of the Lightspout Hollow site.

(Figure 5.16) Exposures in the Lightspout Formation by the path along Lightspout Hollow, showing thinly laminated siltstones and mudstones low-angle ripple cross-lamination and small scours or convolute laminae (centre of picture).

Overlain by cross-laminated sandstone. (Photo: D. Wilson.)