The Pike

[SO 442 950]

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Introduction

The sharp spur that forms The Pike rises between small tributaries on the northern side of the Carding Mill Brook, immediately northwest of Bodbury Hill [SJ 4455 9480]. The ridge has been selected as a GCR site (Figure 5.11) because it contains one of the most informative and well-exposed sections through the Synalds Formation, part of a succession of late Precambrian (Longmyndian) fluvial sediments. As such it provides an important reference to other GCR sites within the thick Longmyndian sequence; the site falls within the existing Long Mynd SSSI.

The Synalds Formation forms part of the Eastern Longmyndian Stretton Group. It was first recorded by Blake (1890; his 'Purple Slate' group), although the term 'Synalds Group' for rocks approximating to this division was introduced by Lapworth and Watts (1910); the sequence was given formational status by Pauley (1990b). The formation comprises up to 850 m of mudstones and siltstones with beds of sandstone. Its base is taken at the top of the Cardingmill Grit, the highest member of the underlying Burway Formation. A series of tuff horizons, the Batch Volcanic Beds (Cobbold, 1900; Greig *et al.,* 1968), occur in the upper part of the sequence at this site. The strata have been described in considerable detail by Greig *et al.* (1968), who considered that they formed in shallow water depositional environments. Modern sedimentological analysis of the formation has been undertaken by Pauley (1986; 1990a,b; 1991), who has suggested that they represent a sequence of fluviatile sediments within the Longmyndian.

Description

The base of the Synalds Formation crosses Bodbury Hill, a short distance east of The Pike. The north-western slope of the hill approximates to a dip-slope in the lowermost beds, which are, however, poorly exposed. The best exposures, in the middle part of the formation, occur along the sides of the small valleys flanking The Pike, and along its crest (Figure 5.11). The beds here have steep westward dips or are vertical; their younging direction, as determined by numerous sedimentary structures, is also to the west. They consist of alternations of predominantly purplish red-brown blocky siltstones and mudstones with subordinate thinly bedded purplish grey sandstones; thin beds of greenish grey siltstone and sandstone occur locally. The mudstones and siltstones commonly occur in beds up to 0.3 m thick, displaying a thin (1 mm or less) colour banding and fine-sand lamination, which appears to represent a series of small graded sandstone–siltstone–mudstone couplets. They are cut by a steeply inclined cleavage, which diverges in strike from bedding by angles of 15° to 20° to produce a clockwise cleavage transection geometry.

Differential weathering has enhanced the lithological contrasts, so that the sandstones form prominent ribs in most exposures; notable examples are displayed in crags ([SJ 4425 9488] to [SJ 4435 9506] on the eastern side of The Pike (Figure 5.12). The sandstones generally occur as laterally persistent, sharp-based, tabular or wavy beds, from 10 mm to 0.15 m thick, in places in bundles up to several metres thick. They are mostly fine- to medium-grained lithic arenites composed largely of volcanic material, with an appreciable quartz component and a small amount of mica. Many sandstones are planar laminated and, in crags on the south-eastern side of The Pike ((Figure 5.11), Locality 1), examples of small-scale, low-angle ripple cross-lamination are visible in one or two places. A few thick beds, up to 0.75 m, of massive, fine- to medium-grained, somewhat discontinuous sandstone occur at intervals within the succession; a typical example crops out over 30 m across a ridge east of The Pike (Locality 2). These sandstones show little evidence of internal structure, other than a local faint lamination and possible trough cross-bedding. Bedding is usually planar but, in places, the basal surface is erosional, truncating the underlying siltstone and mudstone laminae at a shallow angle.

A conspicuous feature of the Synalds Formation is the local abundance of small (1–5 mm) circular or ellipsoidal pits on the upper surfaces of mudstone and siltstone beds. They are readily observed on bedding surfaces on the eastern slopes

of The Pike (Locality 3) and in crags (Locality 4) to the west, in the upper part of the formation. The indentations are probably gravitational load structures, or may be due to the escape of entrapped air, but Greig *et al.* (1968) have recognized other types that may be raindrop imprints or wave-foam bubble impressions. The long axes of the ellipsoidal pits are commonly orientated with cleavage, and may represent formerly circular imprints that have undergone deformation, rather than an oblique impact phenomenon (cf. Salter, 1857; James, 1956). They locally occur with, and are cut by, small branching grooves akin to rill marks. Desiccation cracks have also been reported from other parts of the Synalds Formation crop (Salter, 1857; Greig *et al.,* 1968).

The Batch Volcanic Beds, consisting of two or three horizons of coarse-grained, intermediate, crystal ash and lapilli tuff, crop out on the sides of the Carding Mill Valley, about 350 m west of The Pike. They are described fully in the section on Jonathan's Hollow–Long Batch GCR site.

Interpretation

The common occurrence of rain pits, rill marks, desiccation cracks and allied sedimentary structures within the Synalds Formation (Greig *et al.,* 1968) point to a succession that was subject to repeated subaerial exposure. The widespread red coloration of the mudstones and siltstones may be an early diagenetic feature (Walker *et al.,* 1978; Besley and Turner, 1983), indicative of sediments that underwent oxidation within the weathering profile, above a lowered water table. These are features characteristic of sediments deposited in fluvial or paralic (deltaic, estuarine, tidal flat) environments, although they were at one time regarded with the rest of the eastern Longmyndian, as an essentially deep water, turbiditic ('flysch') facies (Taylor, 1958).

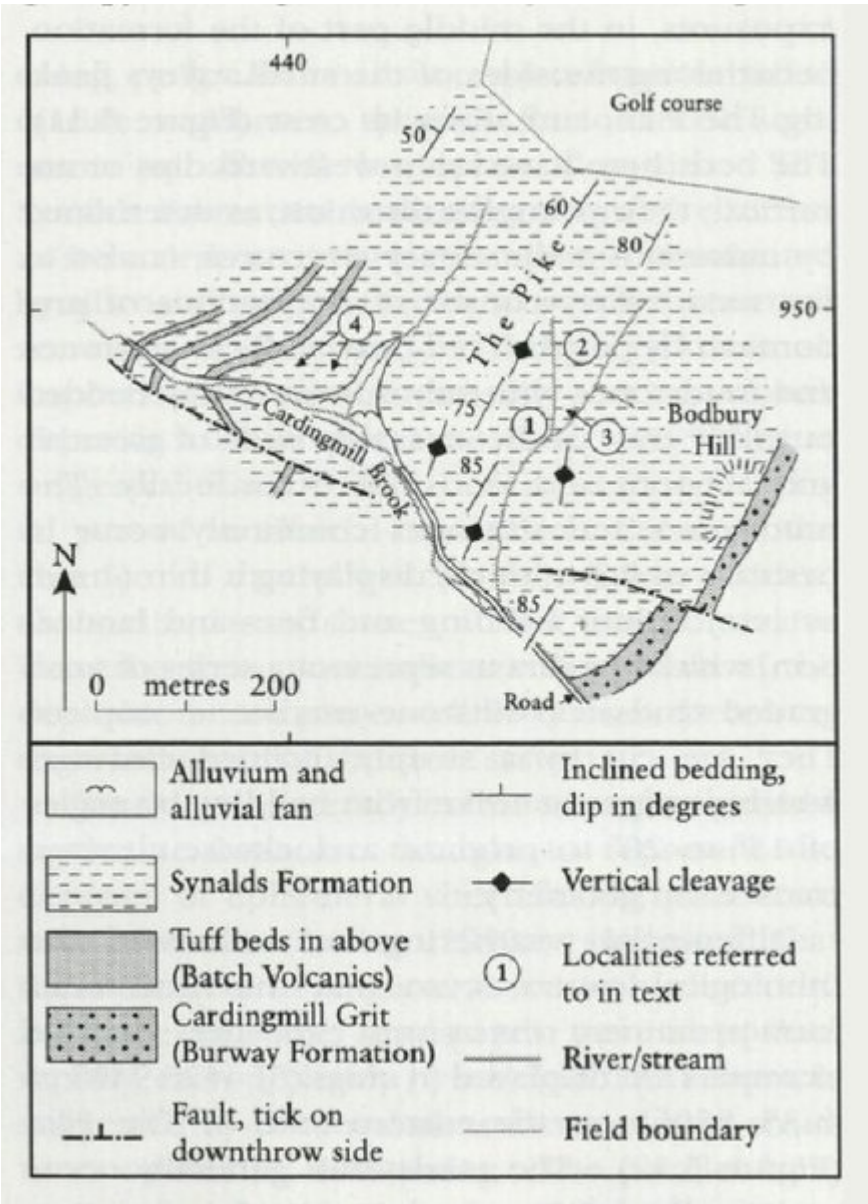
Greig *et al.* (1968) were the first to propose that the majority of Longmyndian sediments were deposited in shallow water, probably in a tidal estuary or delta; they assumed, as had Cobbold and Whittard (1935), that deposition immediately followed, or was partly coeval with, the eruption of the Uriconian volcanic sequence. Most subsequent authors have followed this view (e.g. Baker, 1973; Toghill and Schell, 1984). However, recent work (Pauley, 1990a,b; 1991) has demonstrated that Longmyndian stratigraphy is characterized by a broadly upwards-coars ening, progradational succession from turbiditic marine sequences, through fluvio-deltaic sediments to alluvial braidplain deposits. The Synalds Formation is significant in this context, as it records an intermediate stage, dominated by alluvial floodplain facies, in which the vertical accretion of fine sand, silt and mud was an important process, possibly as overbank deposits from suspension. Pauley (1990b) has suggested that the formation represents the distal part of an alluvial braidplain. Certainly, the absence of laterally accreted, coarse-grained, channelized sandstones and/or conglomerates from the formation indicates that much of the deposition took place well away from the immediate influence of the river system.

The thinner, laterally continuous, fine-grained sandstone beds are thought to represent the deposits of ephemeral sheet floods; palaeocurrent analyses (Pauley, 1990a) suggested that these flowed in a general westerly direction. Evidence that the sandstones were deposited rapidly, each probably by a single flood event, is suggested by the local abundance of load structures caused by dewatering. The parallel lamination that characterizes many of the sandstone beds is indicative of high-energy upper-flow regimes that accompanied sedimentation (Frostick and Reid, 1977; Tunbridge, 1981), the locally developed ripple cross-lamination recording the tractional re-working of the upper parts of the beds as flows waned. The thicker, discontinuous sandstones have been interpreted as the deposits of shallow channels (Pauley, 1990b). It is possible that these developed by channelization of flow during an initial erosive stage, by floods of unusual severity.

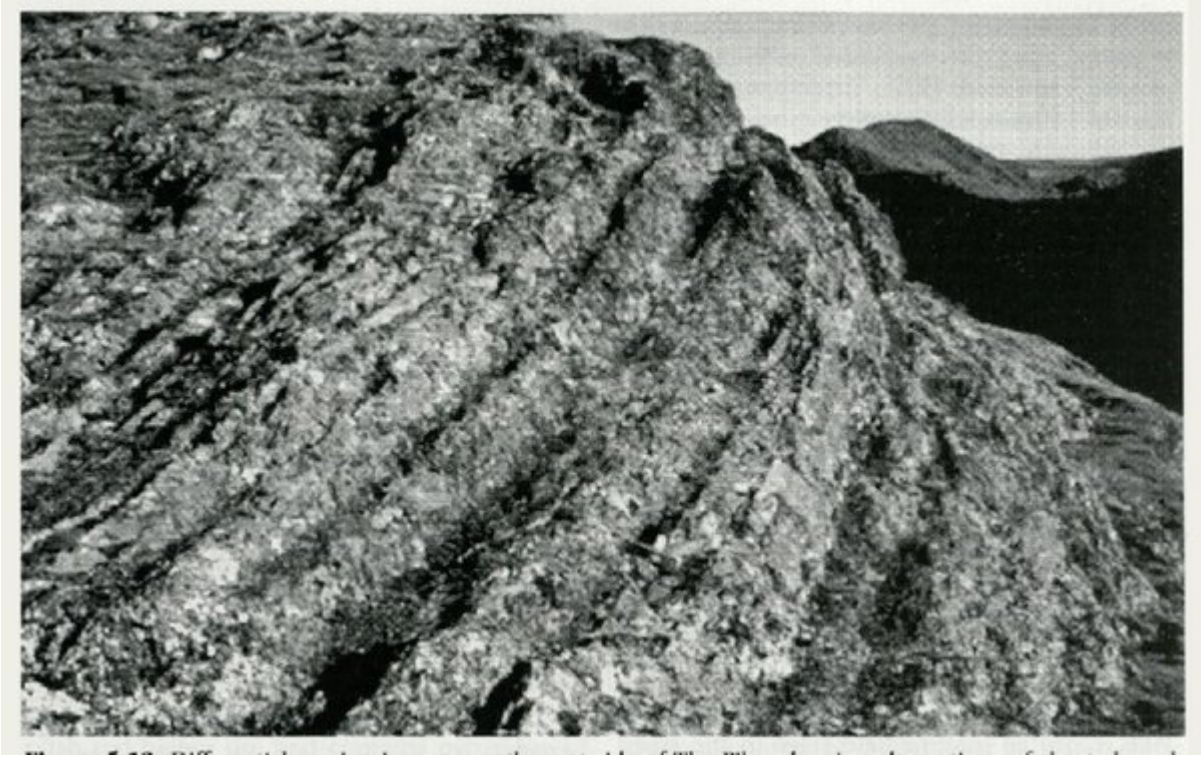
Conclusions

The Pike contains some of the finest exposures through the Synalds Formation, a sequence of I,ongmyndian sedimentary strata laid down on a late Precambrian alluvial floodplain. The various types of sandstone bed, and the diversity of well-preserved, small-scale sedimentary structures at this locality, are important pointers to this depositional environment. By reference to the other nearby GCR sites, the strata represented at The Pike record an intermediate stage in the trend that ultimately led to deposition of coarse-grained beds in the Stretton Group of the eastern Longmyndian sequence.

References



(Figure 5.11) Geological map of The Pike site.



(Figure 5.12) Differential erosion in crags on the east side of The Pike, showing alternations of sheeted sandstones, siltstones and mudstones typical of the Synalds Formation. (Photo: D. Wilson.)