
Shaw Beck Gill, North Yorkshire

[NZ 000 037]–[NZ 011 059]

Highlights

The Shaw Beck catchment, North Yorkshire, contains excellent examples of deposition and erosion resulting from recent and historical large flood events. This site illustrates the important role of infrequent major floods in valley floor development in upland environments.

Introduction

Swaledale and Arkengarthdale, North Yorkshire, were severely affected by flooding on 25 and 26 August 1986 in the wake of 'Hurricane Charley'. This storm produced the wettest day ever recorded for England and Wales (Sawyer, 1987), and resulted in one of the most widespread flood events recorded in the century, especially in the North of England (Newson and Macklin, 1990). Of special geomorphological interest is a diverse and exceptional suite of alluvial deposits (boulder berms, debris-torrent lobes and fans) and landforms (channel avulsions, knickpoints and headcuts) produced by the flood in a series of small, north-bank tributaries of Arkle Beck, most notable of which is Shaw Beck (NZ 0005). In Shaw Beck there is also evidence of three earlier floods that appear to have been of a magnitude similar to that of Hurricane Charley. They are preserved as a series of boulder-covered terraces that, in some reaches, lie up to 5 m above the present river bed. Lichenometric age estimates show that the two younger flood deposits probably date to the 19th century.

Description

Shaw Beck is a very steep (0.045 m m^{-1}), boulder-and cobble-bedded stream (catchment area 7.5 km^2) draining part of the southern edge of Scargill Moor, which forms the interfluvium between the Rivers Tees and Swale (Figure 5.1). Between 1700 hours on 25 August and 1500 hours on 26 August 1986, a total of 116.5 mm of rain was recorded in Arkengarthdale with a peak intensity of nearly 9.5 mm hr^{-1} (Newson and Macklin, 1990). This resulted in the overtopping and breaching of a small reservoir (0.2 ha in area, mean depth of 1.5 m), at the head of Shaw Beck, that sent a flood wave down the valley with an estimated peak discharge of $23.4 \text{ m}^3 \text{ s}^{-1}$. This broke through spoil heaps adjacent to the disused Stang Mine [NZ 009 058] (Figure 5.23) and transported several thousand tonnes of coarse mining debris up to 300 m downstream, infilling and choking the pre-flood channel and burying the former floodplain to a depth approaching 1 m. Immediately downstream, however, at Shaw House (Figure 5.23), where the valley floor narrows, considerable erosion occurred during the flood, resulting in the stripping and flushing out of older alluvium and localized channel incision into bedrock in reaches underlain by interbedded shales and sandstones. There is a clear alternation between flood-eroded/incised and depositional reaches along Shaw Beck, their location being controlled primarily by valley floor width. Most coarse flood sediments were deposited at sites of flow expansion, where the valley floor widens, typically in the form of debris lobes which choked former channels and frequently spilt out over the adjacent floodplain. Channels were subsequently re-established either by headcuts migrating upstream re-excavating their pre-flood course or by avulsion across the floodplain around the coarse flood sediment blockage.

Several older flood deposits were eroded and exposed during the August 1986 flood event, all of which have morphologies and sedimentary features very similar to those of the Hurricane Charley flood sediments (Figure 5.24). Three major flood units are evident, which form a series of prominent terraces along Shaw Beck. Boulder deposits on the two lower terraces (Figure 5.23) have been dated by lichenometric techniques (using the lichen species *Rhizocarpon* sp.) and appear to have been formed by floods reported by local commentators in 1835 and 1866. Coarse flood deposits attributed to the latter event, which seems on the basis of boulder size to have been of a magnitude similar to that of Hurricane Charley, are evident at a number of sites in Shaw Beck. High trace metal concentrations in some historical flood units indicate that they are composed partly of mining waste brought down into Shaw Beck by hydraulic mining

'hushing' of adjacent hillslopes to expose lead ore.

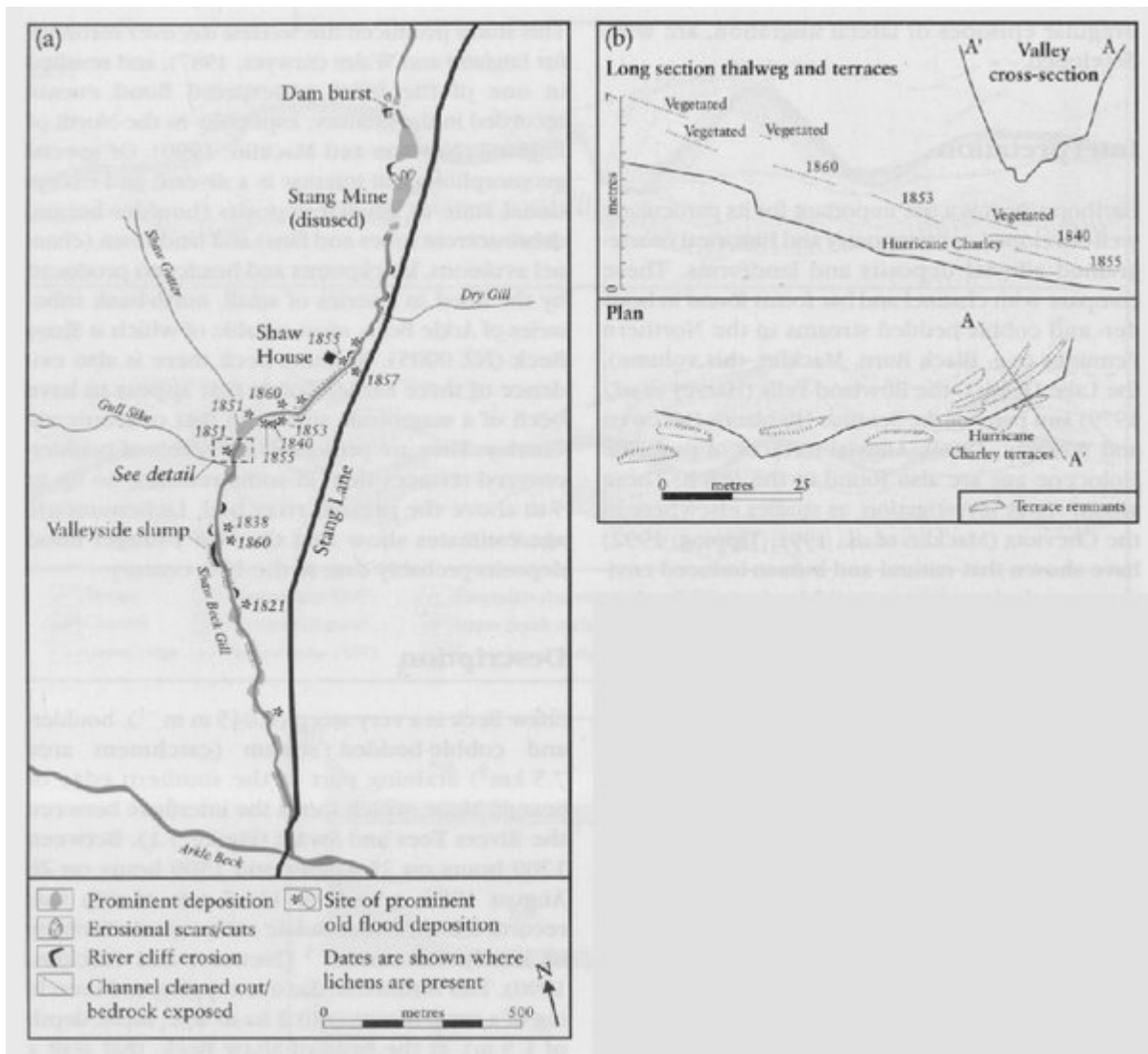
Interpretation

Shaw Beck illustrates in a very dramatic fashion the impact of a major flood, with a return period of around 50 years, on a small upland valley system. The variety and spatial variability of river landforms and deposits produced during this single flood event is particularly noteworthy, especially when attempting to reconstruct the hydrodynamic environment and sequence of past floods. The formation of similar boulder berm and debris-torrent sediments has been described in Langden Beck, Teesdale and West Grain, Weardale, following a flash flood in July 1983 (Carling, 1986). In these streams, however, no older flood deposits were identified, and in this respect Shaw Beck is an important site, having both recent and historical coarse-grained flood deposits available for study in one catchment.

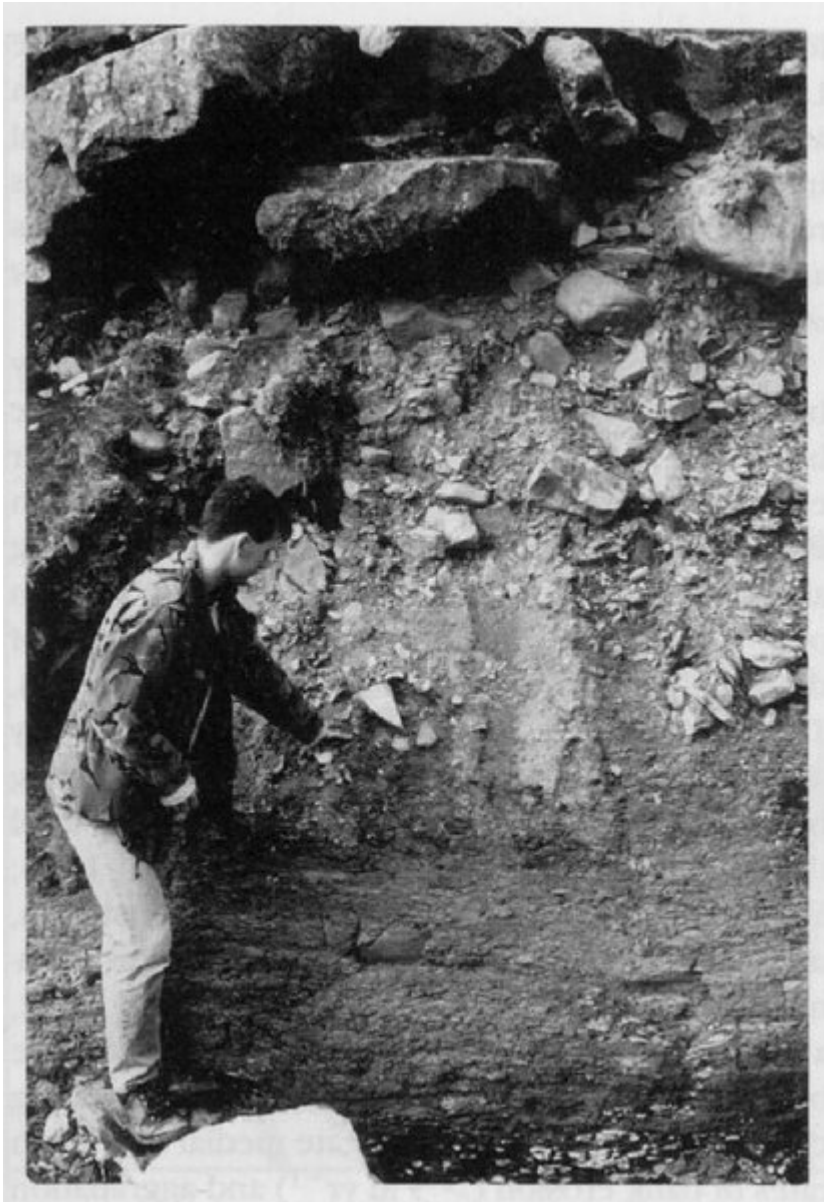
Conclusion

A diverse and spectacular range of coarse-grained alluvial sediments and landforms were produced by a major flood (Hurricane Charley) between 25 and 26 August 1986 in Shaw Beck, Arkengarthdale, North Yorkshire. Downstream patterns of erosion and deposition appear to have been controlled principally by the availability of coarse sediment, by channel slope and by valley floor width. The deposits of three earlier large floods (two of which date to the 19th century), which appear to have been of a magnitude similar to that of Hurricane Charley, are found also on a number of river terraces in Shaw Beck. Hurricane Charley demonstrated very clearly the geomorphological effectiveness of infrequent, high-magnitude events in shaping the alluvial floors of small catchments in the British uplands.

[References](#)



(Figure 5.23) The plan (a) and sections (b) of the Hurricane Charley and historical flood sediments in Shaw Beck, Arkengarthdale, North Yorkshire. (After Newson and Macklin, 1990.)



(Figure 5.24) Shaw Beck: historical coarse-grained flood deposits overlying bedrock terrace. (Photo: M.G. Macklin.)