River Nent, Blagill, Cumbria

[NY 745 466]

Highlights

This site in the Nent valley (one of the most intensely mined parts of the Northern Pennines) provides a rare combination of cartographic, geomorphological and trace metal evidence that can be used to interpret the sequence and causes of historical river metamorphosis.

Introduction

The River Nent at Blagill was the first site in England at which metal mining and flood-related channel and floodplain metamorphosis were demonstrated (Macklin, 1986). It also provided the impetus for subsequent examinations of the impact of historical flooding and metal mining in other river systems of the Northern Pennines (Macklin and Aspinall, 1986; Macklin and Lewin, 1989; Macklin *et al.,* 1994a; Rumsby and Macklin, 1994). Channel and floodplain sedimentation patterns can be documented in considerable detail at this site over a 200 year period, which constitutes the longest record of historic river channel change in northern England.

Description

The site is located 2.5 km east of Alston, Cumbria (Figure 5.1), along a 925 m reach of the River Nent between Foreshield Bridge [NY 748 467] and an unnamed bridge just south of Blagill [NY 740 469]. Evidence of recent channel metamorphosis initially drew attention to this site, at which a number of poorly vegetated, elongate gravel bars, typical of those found within a multi-channel braided river system, are currently being incised by a single-thread channel of much lower sinuosity (Figure 5.7). Three valley floor river landform elements were identified in the reach (Figure 5.8). The first of these, located on the north-eastern side of the Nent valley, is a low alluvial terrace 1.5–3.0 m above the present river bed. Serial cartographic and photographic sources have shown that this terrace lay beyond that part of the valley floor reworked by the channel since 1775. During this period, judging from the fine-grained nature of its deposits, it had received sediment only when floodwaters had overtopped the river bank. Trace metal analyses of laminated silts and silty sands which make up this unit revealed high metal concentrations throughout the sequence (Figure 5.9), indicating that it had been deposited during a period of large-scale mining (in the Nent valley, this dates from 1680). High zinc concentrations in the upper 0.5 m of this alluvial unit mark the advent of zinc mining in the Nent catchment, which began shortly after 1880 (Dunham, 1990). Lead production peaked shortly before this (1840–80) and maximum lead concentrations are recorded in sediments immediately below those with highest zinc levels.

The second major historical alluvial unit at Blagill is an abandoned braided channel system, up to 1.5 m above the present river bed (Figure 5.8), which historical maps and aerial photographs show to have been active from the middle of the 19th century until the late 1940s.

The present-day channel and floodplain (post *c.* 1950) form the third valley floor element. They are incised and inset within mining-age alluvium, with contemporary stream flow confined to a single-thread channel located towards the centre of the valley floor. The contemporary channel has low width : depth ratios except where erosion has removed older alluvium and coarse sedimentation occurs in the form of small point-bar complexes or lobate bars. Channel avulsion during a major flood in August 1986 breached the valley floor adjacent to palaeo-braid bar 10 (Figure 5.8) and resulted in the abandonment of a channel on the south side of the site downstream of cross-section 3 (Figure 5.8).

Interpretation

An excellent range of large-scale topographic maps and aerial photographs, spanning the period 1775–1984, enables changes in channel position and river planform at the site to be documented in more detail over the past 200 years (Figure 5.10). In addition, lichen-based age estimates of poorly vegetated gravel units allow channel bar development and abandonment to be examined between *c.* 1896 and 1950. Braiding began initially in the most upstream part of the study reach (Figure 5.10), followed between 1896 and 1950 by an intermittent downstream movement of coarse gravel in the form of a jerky sediment wave (Figures 5.8 and 5.10).

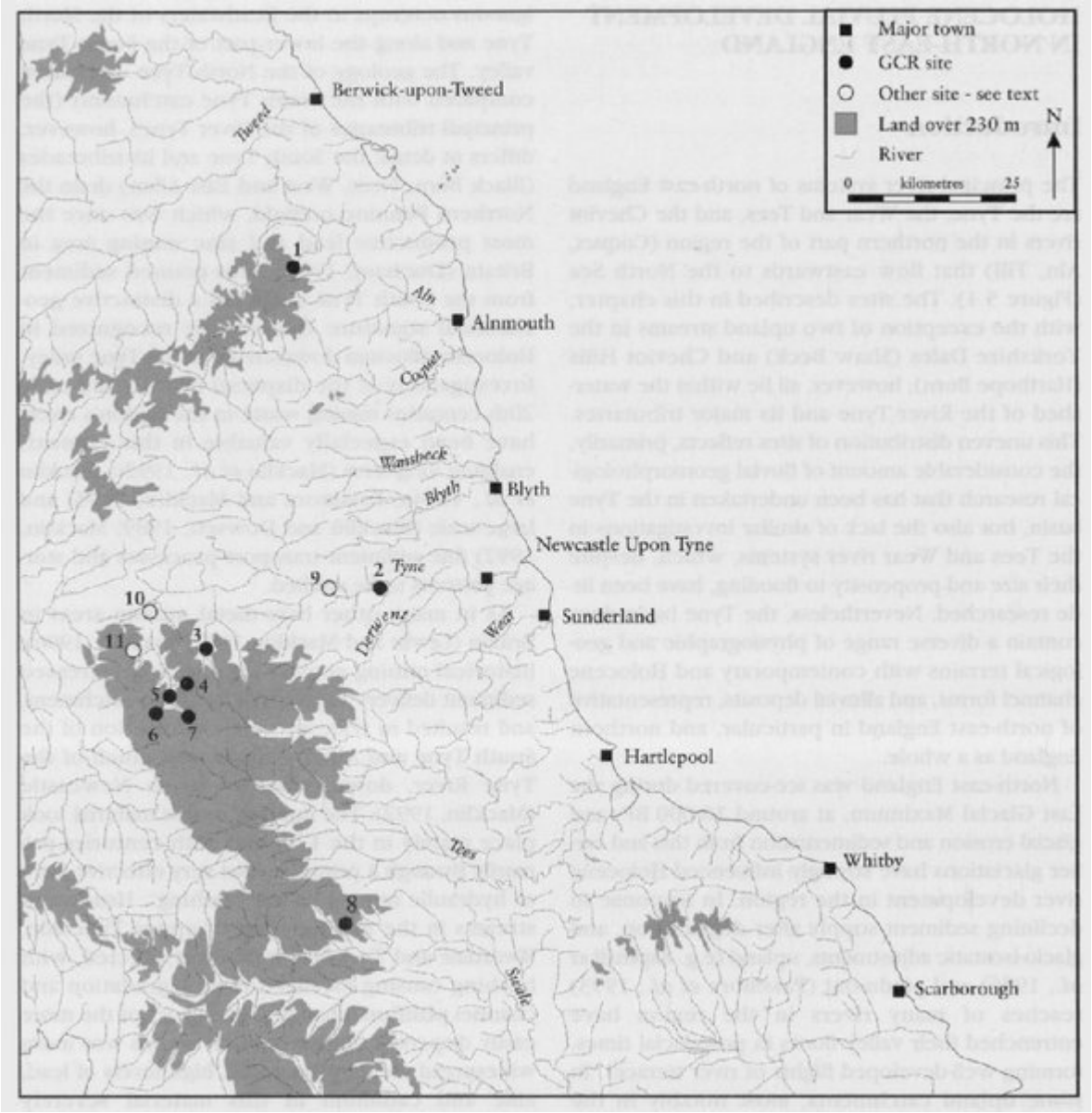
Maps show the River Nent at Blagill over a 60 year period between 1775 and after 1840, as a laterally stable, single-thread channel of relatively low sinuosity (Figure 5.10). By 1861, however, a dramatic metamorphosis of the floodplain and channel had taken place, with considerable bank erosion, deposition of gravel and a change from a single- to a multi-thread channel. The initial transformation appears to have followed a series of major floods in the 1840s, although metal mining, by providing a ready source of coarse sediment, both indirectly prepared the site for metamorphosis and also perpetuated the transformation by continuing to supply waste of bedload calibre to the river system. Furthermore, severe metal contamination of the valley floor significantly retarded post-flood floodplain stabilization by preventing vegetation from recolonizing alluvial surfaces. Post-mining (after World War Two) floodplain readjustment has involved rationalization and simplification of the channel system into a single rather sinuous channel, as the river has incised through its alluvial valley floor. Since 1948 significant departures from this adjustment to reduced rates of sediment supply have occurred only during major floods, when old channels have been temporarily re-occupied.

Investigation of the recent alluvial history of the River Nent at Blagill can be considered to be exemplary in its use of field mapping, serial historical maps and aerial photographs, lichenometry and trace metal analysis for elucidating the role of floods and metal mining in channel and floodplain metamorphosis. It is one of only a handful of sites in England and Wales, outside the South Tyne basin, where historical channel and floodplain transformation has been documented. In addition, it is the only site in Britain (with the exception of Black Burn, Cumbria) at which it has been possible to date and map the down-valley passage of a sediment wave. Finally, it demonstrates the value of trace metals as stratigraphic markers within sequences of fluvial sediments in a region in which the development and history of metal mining is known in some detail.

Conclusion

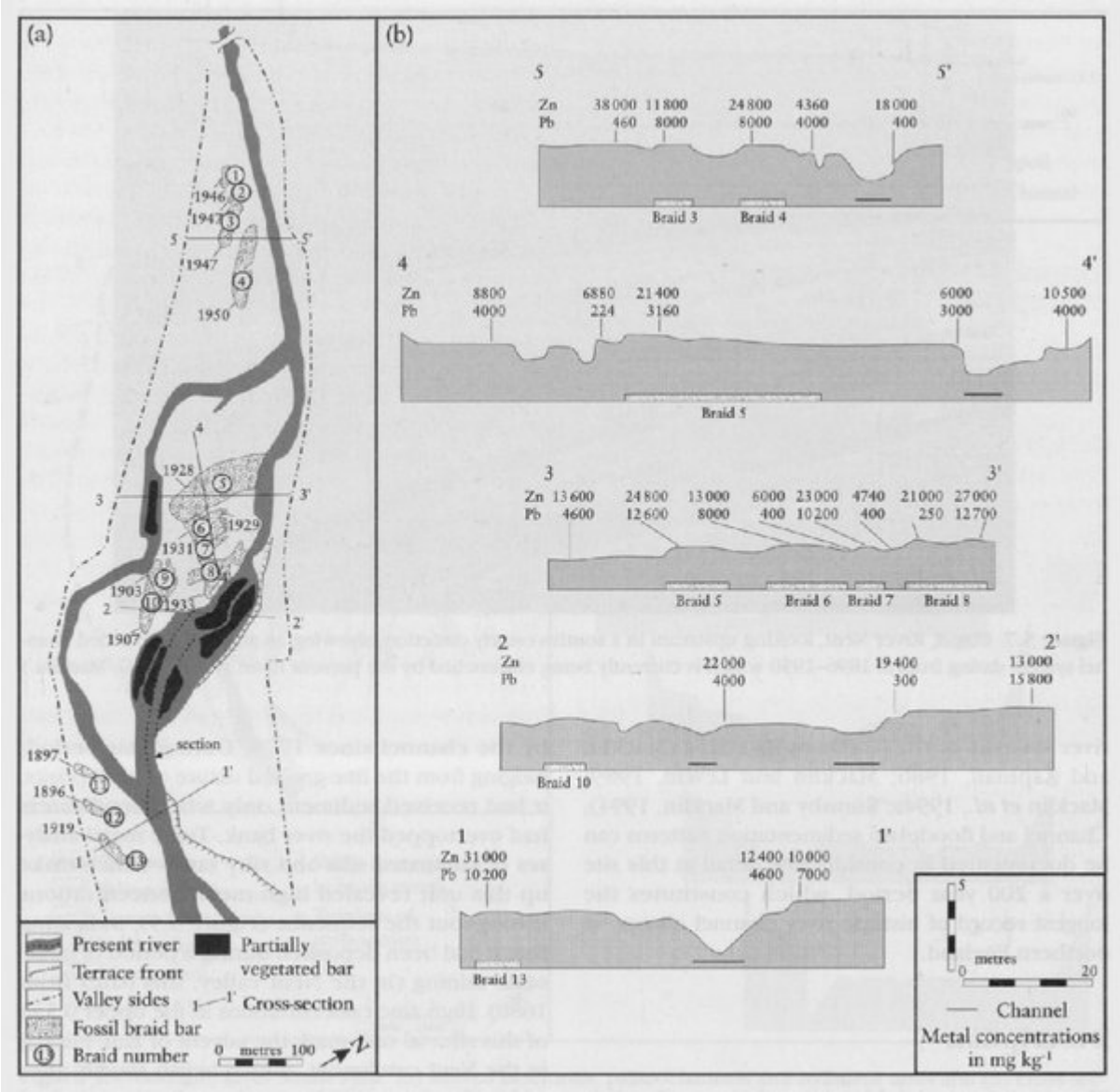
The River Nent at Blagill has the longest (1775–1984) and the most detailed map and aerial photograph based record of channel change in northern England. Cartographic and photographic sources, together with field mapping, lichenometry and trace metal analysis, have been used to date river transformation associated with historical floods and metal mining, as well as documenting the intermittent, down-valley movement of coarse bedload sediment.

References

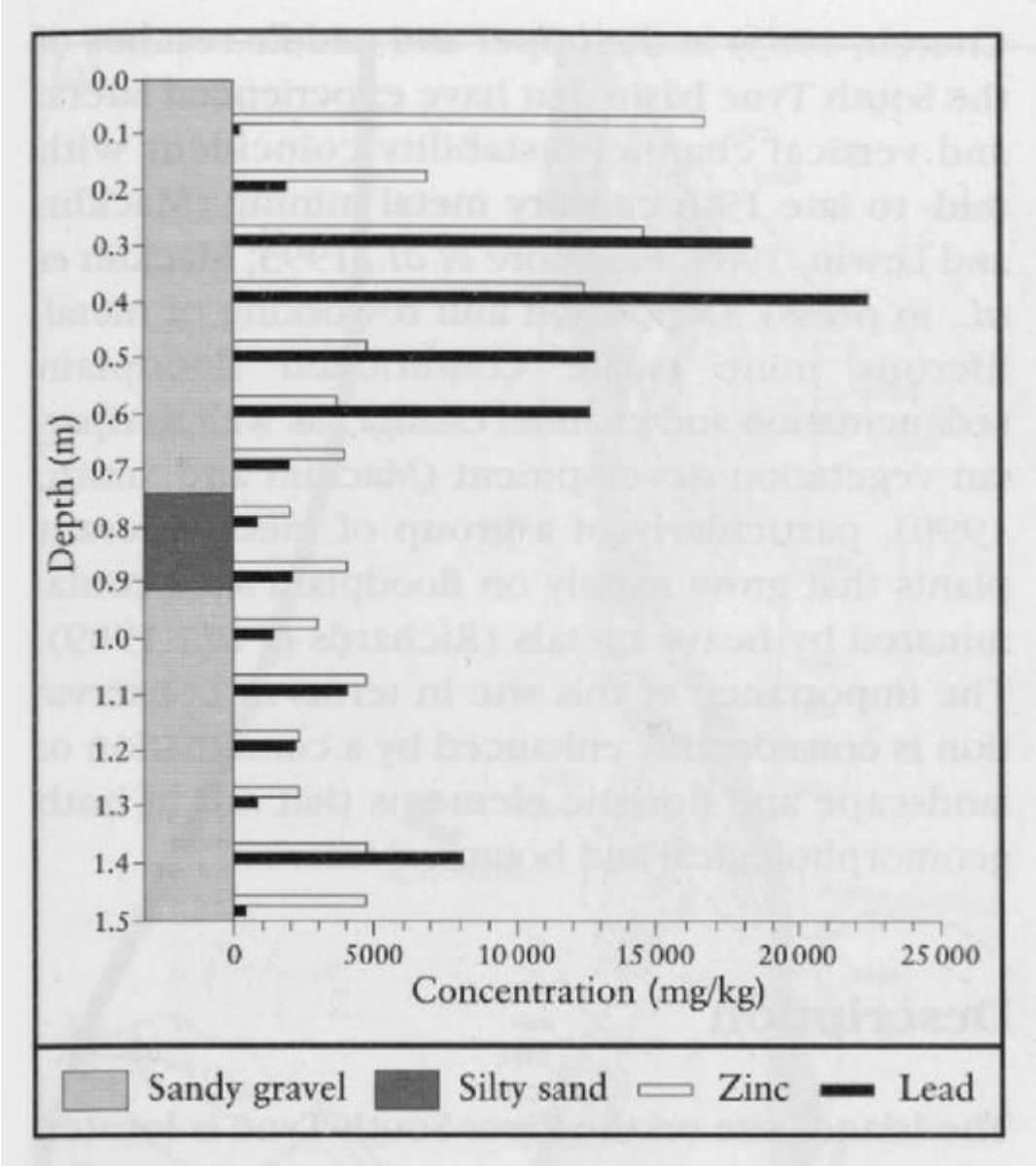


(Figure 5.1) The major river systems and relief of north-east England. GCR Sites: 1 Harthope Bum; 2 Low Prudhoe; 3 Blackett Bridge; 4 Blagill; 5 The Islands, (Alston Shingles); 6 Black Burn; 7 Garrigill; 8 Shaw Beck. Other sites descibed in the text: 9 Farnley Haughs; 10 Lambley; 11 Thinhope Burn.

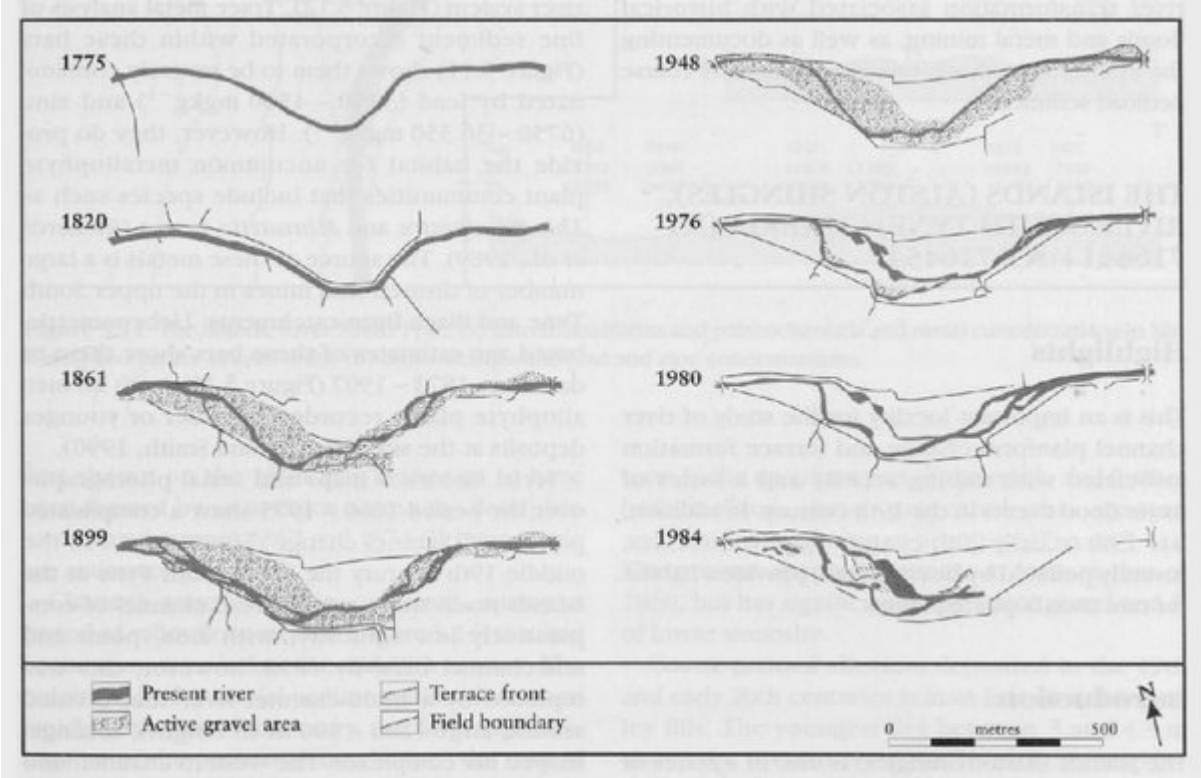
(Figure 5.7) Blagill, River Nent, looking upstream in a southwesterly direction, showing an abandoned braided channel system dating from c. 1896–1950 which is currently being entrenched by the present river. (Photo: M.G. Macklin.)



(Figure 5.8) Nent valley at Blagill: (a) alluvial landforms, sediment units and metal concentrations in the historical floodplain and earlier alluvial sediments; (b) cross-sections. (After MacIdin, 1986).



(Figure 5.9) An up-section plot of metal concentrations in the low alluvial terrace at Blagill. The location of the section is shown in (Figure 5.08). (After Macklin, 1986.)



(Figure 5.10) Channel change at Biagill, River Nent, 1775–1984. (After Macklin, 1986.)