Blackett Bridge, River West Allen, Northumberland

[NY 780 540]

Highlights

The Blackett Bridge site affords an opportunity to study late Holocene and historical river erosion and sedimentation styles in the River West Allen, one of the principal tributaries of the River South Tyne. The pattern of recent river development at this site is similar to that of many other upland rivers in the Northern Pennines affected by historical metal mining, although this site is of special interest because of a gravel splay deposited by a flash flood in 1848.

Introduction

Historical floodplain sedimentation and channel development of the River West Allen, 1 km downstream of Ninebanks [NY 782 533], Northumberland, has been shown (Macklin and Aspinall, 1986) to be geomorphologically representative of many smaller river valleys (e.g. East Allen, Devil's Water and the Derwent) that drain the north and north-east parts of the Northern Pennines. All valleys in this part of the Northern Pennines are underlain by Namurian rocks of Carboniferous age, and were considerably modified during Pleistocene glaciations and grossly polluted by historical metal mining. Recent river deposits and Quaternary alluvial landforms at this site therefore serve as a useful benchmark for future studies of valley floor development in the region.

Description

The extent to which valley floors in the Northern Pennines have been reworked by recent lateral channel migration appears to depend on whether channels are located in a basin, where postglacial incision has removed earlier Pleistocene deposits and contemporary rates of channel migration are generally high, or in steeper gradient rock or drift-bound reach where lateral channel movement is restricted. In this respect the River West Allen, along a 1150 m reach centred on Blackett Bridge [NY 781 540], is morphologically typical (Figure 5.15)(a). The locality includes two alluvial basins, each approximately 400 m in length and up to 200 m wide which, over the period of topographic documentation (1859 to the present), have been characterized by comparatively high rates of both lateral and vertical channel movement. These sedimentation zones are separated by a short (200 m), narrow (70 m) reach where the channel is confined by Pleistocene glacial deposits.

Above the level of the historical floodplain, three terraces are evident; the highest (T1, 20 m above the bed of the present river) is of Pleistocene age and comprises glaciofluvial gravels overlying till. There are two younger Holocene river terraces; the oldest (T2) lies 3 m above the present river bed and comprises 2.5 m of horizontally bedded sandy gravels overlain by 0.5 m of silty sands. A tree trunk recovered from the base of the gravel member has been ^{14}C dated to *c.* 410 cal AD and shows, similarly to many other sites (e.g. Black Burn) in the upper South Tyne basin, a major phase of valley floor gravel aggradation during, or shortly after, the Roman period (Macklin *et al.,* 1992a; Passmore et al., 1993). The second and lower Holocene terrace (T3) lies 2 m above the present river level and is composed of laminated silts and sands. Trace metal analysis of these sediments shows the whole unit to be highly contaminated with lead (2100–9200 $mgkg^{-1}$; (Figure 5.15)). Although today T3 lies above the level of major floods, it clearly was a site of active overbank sedimentation sometime during the period of large-scale lead mining in the West Allen valley, that took place between 1694 and 1880.

Since the end of the 19th century there has been a general reduction in floodplain width, particularly in the northern alluvial basin, and also a progressive decrease in the area of active gravel and total channel sinuosity (Figure 5.16). Downstream at Blackett Bridge incision of the river bed, following a major flood in October 1900, has resulted in the preservation of an extensive area of coarse-grained alluvium that dates from the turn of the century (Figure 5.17). This includes, on the west side of the valley (opposite Whamlands Farm, (Figure 5.16)), an elongate gravel splay, convex in

cross-section ((Figure 5.15)(a); cross-section A), believed, on the basis of lichen-based age estimates, to have been deposited during a flash flood in 1848. All 19th century alluvial gravels are heavily contaminated by fine-grained metal ore waste released by upstream lead and zinc mining. These gravels do, however, provide a habitat for metallophyte plants.

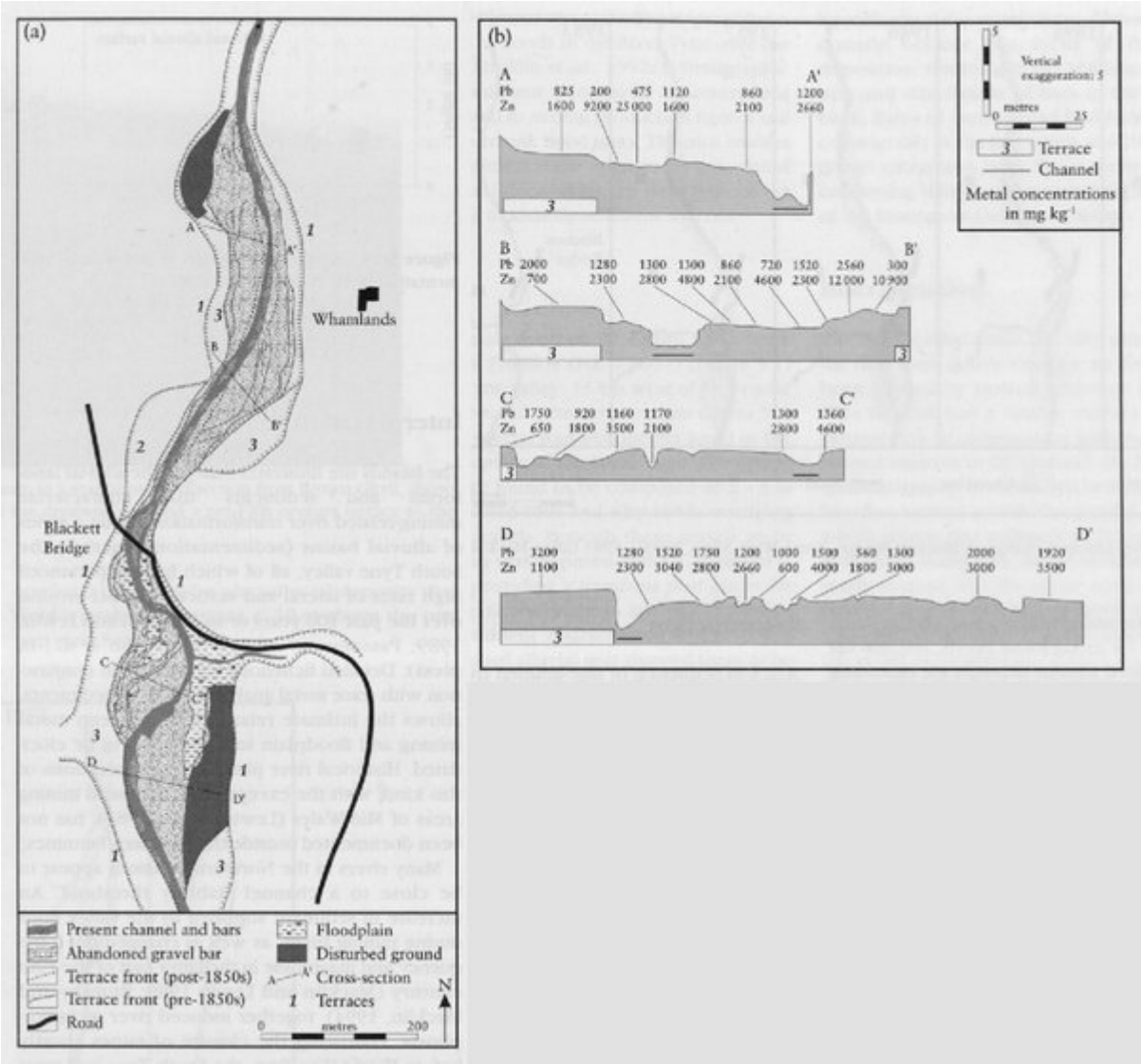
Interpretation

Blackett Bridge in the West Allen valley, along with Lambley in the middle South Tyne valley (Passmore *et al.,* 1993; Macklin *et al.,* in press), is one of only a handful of sites in the Northern Pennines at which river dynamics in contiguous alluvial basins, one currently active and one recently stabilized, can be compared. It provides an excellent example of 'space for time' substitution, which gives a useful insight to the processes controlling alluvial basin development in the region. The site is also of some botanical importance, in that the Rivers West Allen and Nent are the only major tributaries of the South Tyne where metallophyte plants have been recorded growing on historical alluvium.

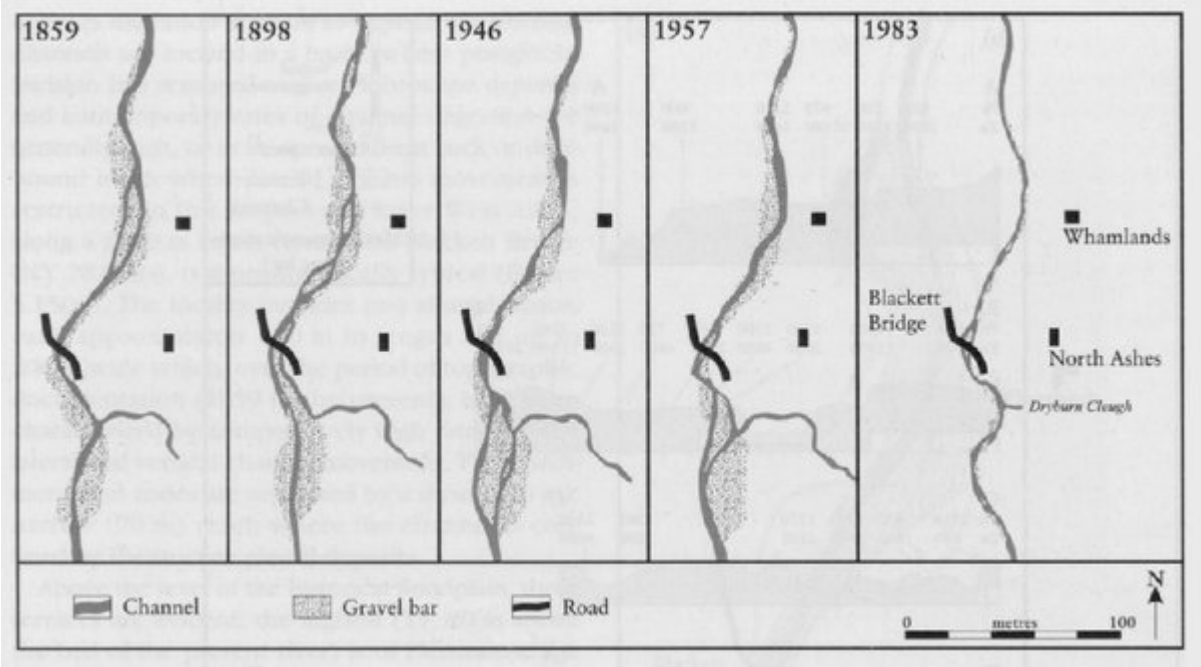
Conclusion

Investigation of the alluvial valley floor in the West Allen valley at Blackett Bridge shows how channel development and deposition have been conditioned by the configuration of earlier postglacial and Pleistocene valley fills. Two contiguous alluvial basins at the site, one currently active and the other recently stabilized, illustrate both contemporary and late Holocene river sedimentation and erosion processes that appear to be typical of many Northern Pennine rivers.

References



(Figure 5.15) (a) Blackett Bridge, River West Allen. Floodplain and valley floor morphology, cross profiles and metal concentrations for alluvial units. (After Macklin and Aspinall, 1986.) (b) Blackett Bridge, River West Allen. Cross-sections. (After Macklin and Aspinall, 1986.)



(Figure 5.16) River channel change at Blackett Bridge, River West Allen, 1859–1983 (after Macklin and Aspinall, 1986.)

(Figure 5.17) Blackett Bridge, River West Allen, looking downstream in a northerly direction, showing a late Roman age terrace on the left of the present channel and a 19th century terrace on the right. (Photo: M.G. Macklin.)