Afon Rheidol, Ceredigion

[SN 650 800]

J. Lewin

Highlights

A well-studied sequence of post-glacial terraces characterize this site, where active erosion by a confined meandering channel creates good riverbank exposures. Historical metal mining has involved the incorporation of metals into alluvial deposits, and interrelationships between mining activity and floodplain development can be identified.

Introduction

Holocene river terraces are attracting considerable academic attention: it is appreciated that alluvial sediments may record periods of landscape instability resulting both from climatic change and the intensity of human activities. Analysis of sites at which sequences of terrace sediments record such fluctuations, coupled with an understanding gained from contemporary observations as to how alluvial materials are deposited, may provide a good understanding of sediment dynamics under fluctuating controls.

The Rheidol has a small (182 km^2) catchment of relatively steep gradient draining westwards to Cardigan Bay. In its lower 10 km the river is actively meandering and has incised itself some 10 m into glacial outwash deposits, at the same time producing a series of incision terraces and alluvial sediment units of contrasting types. While such sequences are known to exist in part in other valleys (e.g. Ystwyth), exposures are rare and much of the preserved record has clearly been removed by later erosion. The Rheidol Valley in particular does, however, contain a very good set of terrace features and sediment exposures along the river bank within a reach of a few kilometres near Capel Bangor. These have been studied in detail recently (Macklin and Lewin, 1986). In addition, historical river-channel changes (Lewin and Brindle, 1977) and the influence of historical metal mining (Wolfenden and Lewin, 1977; Lewin and Macklin, 1987) have also been examined. The site therefore represents one at which both the evidence available and the research analysis undertaken merit careful attention to site conservation.

Description

At Capel Bangor, a flight of five morphological terraces, underlain by seven distinct sedimentary units, can be seen adjacent to the present river channel. Some channel engineering works have taken place, but for the most part the exceptionally fine river-cut bank exposures allow examination of the sedimentary features in great detail, while the river erosion itself (which keeps the bank exposures 'clean') is a valuable example of confined meander development.

The terrace and alluvial sequence is summarized in (Figure 3.23) (after Macklin and Lewin, 1986). The Aberffrwd unit, underlying the highest terrace, T1, is composed of till and gravels which are interpreted as ice marginal outwash and later gravels of Devensian age. The Maes Bangor unit (underlying T2) is a comparatively minor feature but with interesting sedimentary structures, probably laid down in a braided river. The Capel Bangor unit (T3) is the largest feature on the valley floor. It is interpreted as the deposit of a meandering stream, with an exceptionally thick upper fine unit which can be related to the influx of pedogenic material following forest clearance. The remaining units (Rhiw Arthen and the Floodplain Complex; T4 and T5) are again river sediments; the Floodplain Complex contains mining aggradation materials from the 19th century.

Interpretation

Analysis of floodplain sediments (Wolfenden and Lewin, 1977) reveals both their high metal content and the fact that age sequences may be identified in which pre-mining sites of sedimentation (pre-19th century mining was restricted in intensity) and post-mining materials (mining effectively ceased at the beginning of the 20th century) have relatively low metal (Pb, Zn) contents, with a mining era peak and subsequent fall off (Figure 3.24). It is thus possible to derive a detailed picture of metal pollution in both space (fall-off in concentrations down-valley, and concentration in fine sediment zones in particular) and time (in relation to mining activity). The results of this analysis have been widely used as a basis for understanding mining impact in other areas worldwide, and the relatively undisturbed nature of the valley floor (deep ploughing is limited) does contribute to the preser vation of alluvial sediments which are of considerable scientific interest.

Finally, the river channel is cut into both terraces and the floodplain itself: this leads to the formation of confined meanders (Lewin and Brindle, 1977), the mode of development of which is somewhat different from 'free' meanders developed on open floodplains. The former tend to develop more slowly than the latter, eventually producing cutoffs adjacent to the scalloped fringe of the terrace itself. During development, the river can become orientated towards the upstream end of cut-bank arcs, with braiding of the material derived from the erosion of the high terrace within the channel. This illustrates both the singular nature of channel developments in such locations, and the role of available sediment supply in channel pattern development. It should be appreciated that the land loss/transfer involved does lead farmers and the water authority to undertake *ad hoc* channelization and bank protection measures. These have been partially, but not completely, successful in decreasing mobility, and they do of course modify future natural trends in channel development.

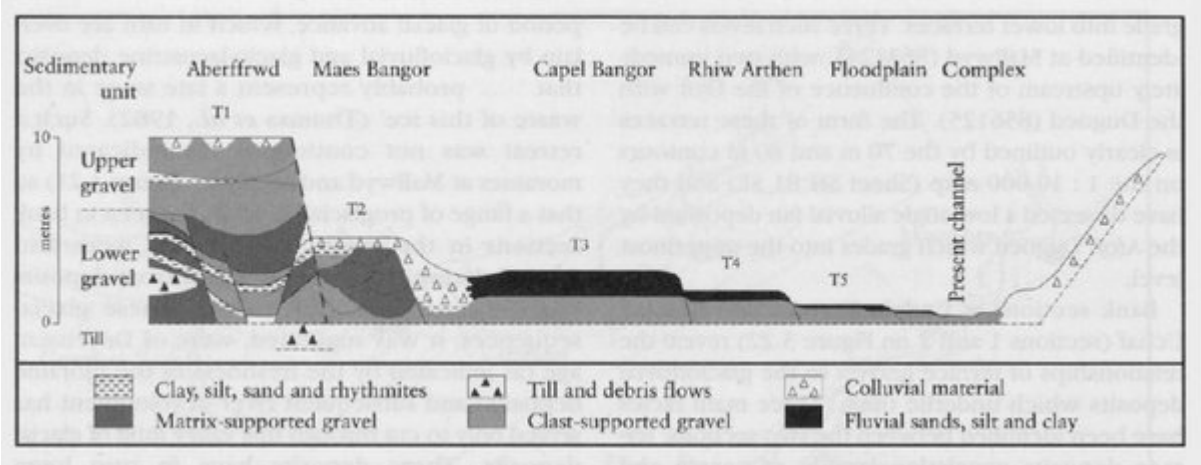
This river reach is of exceptional scientific interest in that (i) it represents a rarely available sequence of alluvial sediments in a flight of terraces with good exposures which allow valuable inspection and analysis; (ii) present river activities represent a type example of confined meander development which takes place slowly (over a scale of many decades) and is much modified by channel works where these are undertaken; (iii) the flood-plain sediments themselves are comparatively undisturbed, and record development of floodplains under the influence of historical mining activity.

These characteristics mean that this site incorporates a variety of closely analysed evidence for alluvial valley floor development over an extended timescale.

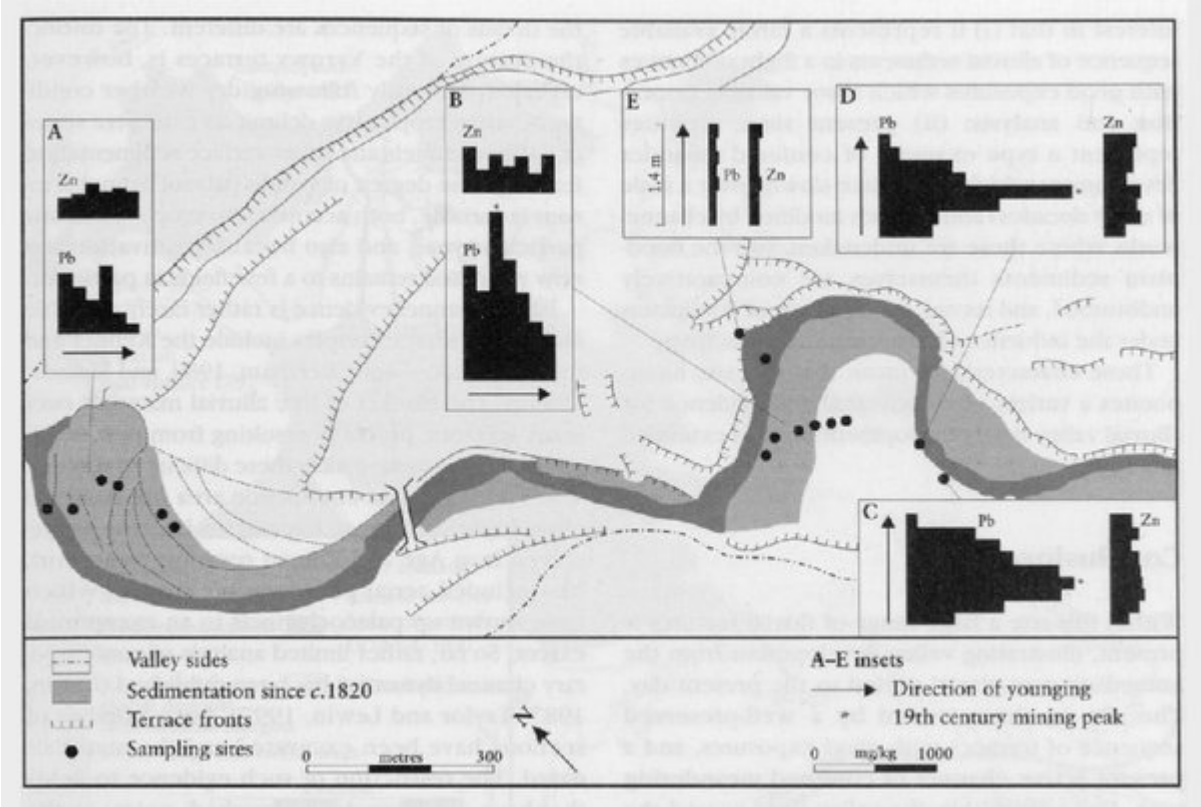
Conclusion

Within this site a large range of fluvial features is present, illustrating valley development from the immediate post-glacial period to the present day. The site is characterized by a well-preserved sequence of terraces with good exposures, and a present active channel of confined meandering type. Deposits within the valley floor record the influence of mining activity. All of these aspects have been thoroughly researched, establishing an international significance for the site.

References



(Figure 3.23) The Afon Rheidol: the sedimentology of the Rheidol terraces. (After Macklin and Lewin, 1986.)



(Figure 3.24) The Afon Rheidol: metals (lead and zinc) in river sediments. (After Macklin and Lewin, 1986.)