
Alport Valley, Derbyshire

[SK 118 938]

Highlights

The Alport valley, draining the eastern slopes of Bleaklow, illustrates the morphology formed in upland channels where, with limited sediment supply, the river cuts into the underlying bedrock forming step-pool features, rapids and waterfalls.

Introduction

The origin of meandering bedrock valleys has intrigued and frustrated geomorphologists. A major difficulty is the inability to observe and measure the processes and rates of erosion in bedrock channels, or to monitor long-term changes in their position in response to the slow rate of operation of the relevant processes.

Description

Bedrock channels occur wherever potential rates of removal of material exceed sediment supply: in upland areas with steep slopes, in glaciated hard-rock regions, and in areas undergoing active tectonic uplift. Alport Valley (Figure 6.30) is cut in sandstone with very steep slopes which have contributed to the spectacular landslips of Alport Castle downvalley from the site. Parts of the stream channel are cut in bedrock, while elsewhere discrete concentrations of coarse material form the bed. The valley has waterfalls and rapids usually associated with bedrock channels, which are more likely to be caused by resistant strata on the stream course than by rejuvenation (Petts and Foster, 1985).

Parts of the stream channel also possess the step and pool form characteristic of mountain and upland rivers. The step-pool structure gives rise to a distinctive tumbling flow pattern. Bedload transport processes in such streams are strongly linked to the bed form. Steps are formed of large bed elements, often of the order of the depth of flow, or even the width of the channel. The coarse sediment is transported from discrete sites and stored in pools.

Alport Valley also has the typical narrow, discontinuous floodplain of steep channels. An analogy with the headwater tributaries of lowland streams highlights several important differences in behaviour between upland and lowland rivers (Lisle, 1987). Direct inputs of sediment from hill-slopes to upland streams cause sediment transport to be episodic. Resistant, non-alluvial boundaries inhibit lateral migration and can control the position of large-scale bedforms. Where the stream channel is unconfined, it forms a freely meandering planform in alluvial material.

Interpretation

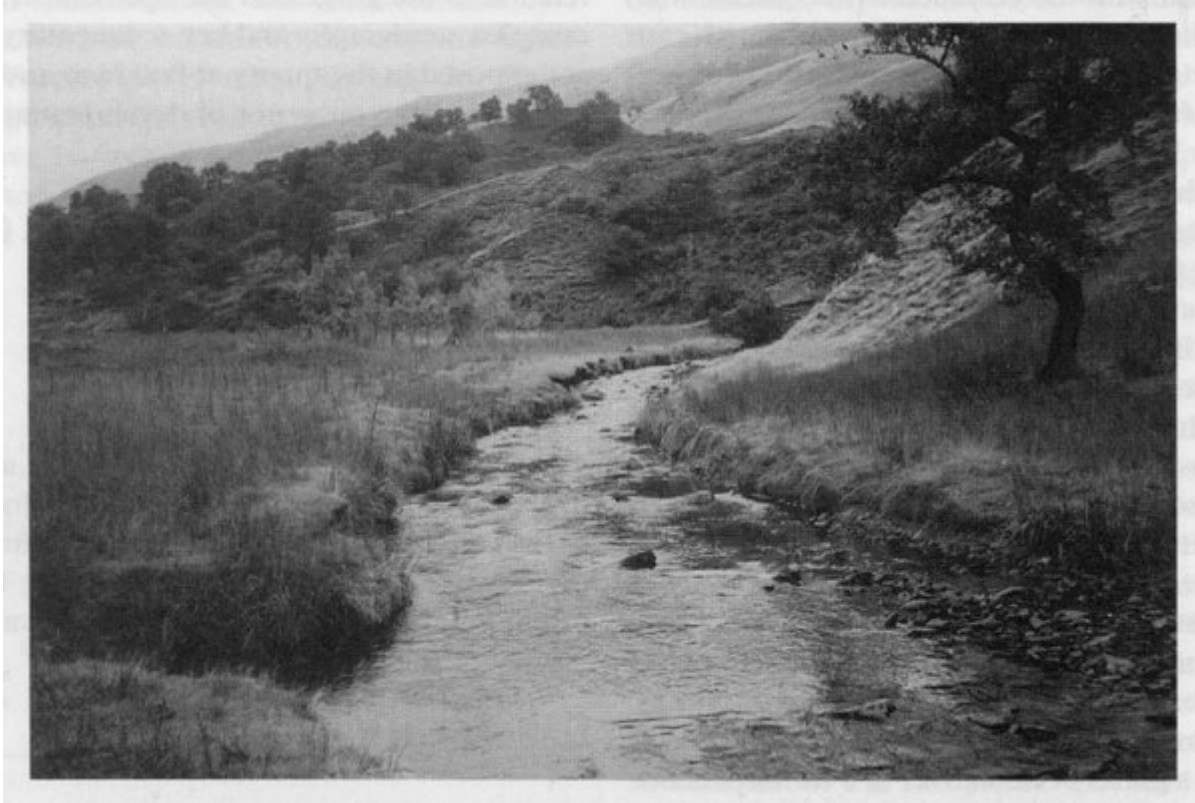
Dominant channel-forming discharges tend to be less frequent in upland channels than in lowland ones. High-magnitude, low-frequency events can be more effective in shaping upland channels. The steep valley slopes, in parts of the site forming vertical bare rock cliffs, and the locally constrained valley bottom, can generate extreme unit stream power. Bed or bank materials are generally too large or too resistant to deform in all but the most extreme events, and post-flood flows may be unable to modify the resulting forms of large floods.

Alport Valley is important for its assemblage of fluvial landforms typical of upland rock-bed and coarse bedload channels, in addition to possessing meandering reaches in unconfined situations. The concentration of channel landforms such as cap-rock waterfalls, rapids, steps and pools, and bedload features, together with valley landforms including hanging tributaries, discontinuous flood-plains and terrace surfaces, make it a classic representative of this type of stream. Although little specific research has been undertaken in the valley, it has the potential to help understand the formation of bedrock meanders and bedrock channel features.

Conclusion

The Alport Valley contains excellent examples of the features typical of an upland channel cut in bedrock. These include waterfalls, steps and pools, a narrow floodplain, steep valley sides, coarse bed-load and direct sediment input from the slopes.

References



(Figure 6.30) The Alport Valley illustrates the morphology of upland channels where, with limited sediment supply, the river cuts into bedrock. (Photo: R.J. Davis).