Liuibeg Burn, Aberdeenshire

[NO 020 936]

L.J.McEwen

Highlights

The Luibeg Burn provides an excellent example of a coarse-grained mountain torrent, which demonstrates the important roles of confinement and channel slope in determining channel planform. This site also has a well-documented history of channel response to major floods, to an extent rare in such a remote upland environment.

Introduction

The Luibeg Burn, a headwater tributary of the Lui Water, drains a 14.6 km^2 catchment of the south-facing Cairngorm massif (Ben MacDhui, 1310 m). The underlying bedrock is granite, while in terms of surficial deposits, Glen Luibeg contains many large kames and other glaciofluvial landforms (Sissons, 1976). This valley was formerly controlled by a large rock-cut meltwater channel. Much of the information in this account is derived from McEwen (1986).

Description

The Luibeg Burn, within the upper River Dee catchment, Aberdeenshire, provides a classic example of a coarse-grained mountain torrent (Ferguson, 1981). The burn in its upper reaches (above the Parker Memorial Bridge) is highly constrained, with the channel bordered by steep talus slopes. Downstream of this bridge, there is a sudden increase in the width of the valley floor, permitting channel migration and large amounts of readily accessible sediment which can be reworked (Figure 2.37). Extensive deposition of boulders has occurred proximal to the present channel, indicating the geomorphic impact of one or more major floods over a historical period.

Interpretation

The site possesses a well-documented history of the geomorphic response to rare high-magnitude flooding for such a remote catchment. First in this history was the summer frontal storm of 4 August 1829, reported to have affected the upper River Dee catchment (Lauder, 1830). Regional estimates for the recurrence interval of the discharges within the neighbouring Spey and Findhorn catchments are as high as 500–1000 years (Werritty and Acreman, 1984). Eyewitness accounts (e.g. Burton, 1864) indicate that this storm triggered extensive debris flows on Ben MacDhui and also the flushing of large amounts of sediment into the site, leaving a very coarse floodplain deposit over 150 yards wide (Barrow and Cunningham-Craig, 1912). Confirmation of this extensive deposition is provided by the OS First edition, 10 560 map of 1869 in which the path down Glen Luibeg is recorded as having been completely obliterated by the flood deposits.

Map and aerial photograph evidence over the period 1871–1956 indicate that this site remained relatively unaltered in its upper reaches, the geomorphic impact of the 1829 flood being the major imprint for the following century (McEwen, 1986). For example, major distributary channels, excavated to accommodate the extreme flood discharges, can still be identified. However, on 13–14 August 1956, an intense convective storm occurred with a 24 hour rainfall of 85.6 mm at Deny Lodge (estimated recurrence interval of 120 years; McEwen, 1986) and probably > 150 mm on higher ground (Baird and Lewis, 1957). The resulting flood had a very high competence, with the Parker Memorial Bridge being carried downstream and its supporting masonary piers overturned. The stream bed at the bridge more than doubled its width and heavy deposition was recorded with 'irregular fan-shaped deposits visibly raised above the general level of the neighbouring valley floor' (Baird and Lewis, 1957, p.97) downstream of this point. From aerial photographs, it appears that many of the old flood channels excavated during the 1829 flood were re-occupied and rescoured during this event.

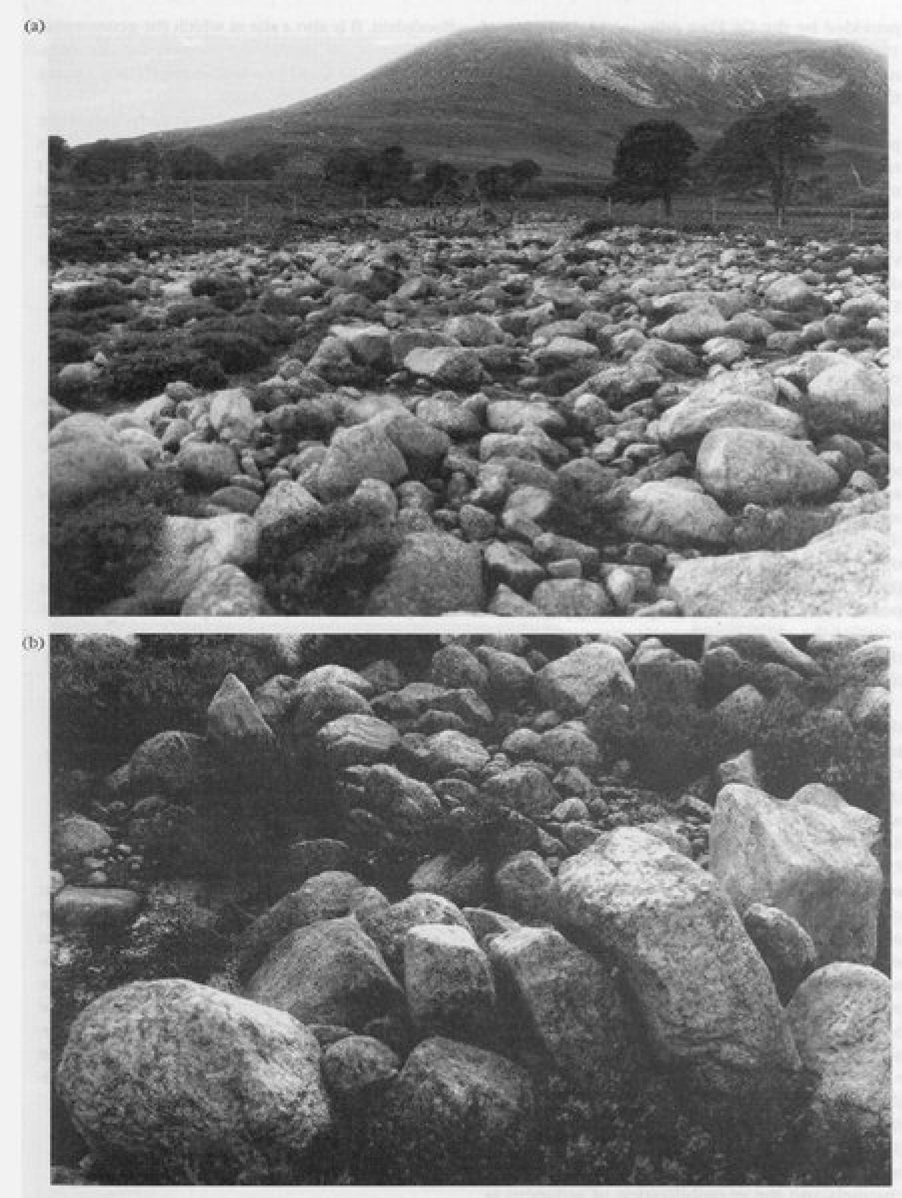
Field survey has revealed a wide area of boulder deposition well above the competence of the normal river and spread out beyond the present channel, which is trenched within these deposits (McEwen, 1986). A large number of abandoned but well-defined flood channels are evident across this floodplain area. The present channel was clearly formed by a flow greatly in excess of normal flow conditions. The 1829 flood was therefore the main channel-forming event, with further excavation occurring during the 1956 flood. Median sediment size at the head of the reach was 70–120 mm, while estimated bankfull stream power at the head of the reach is in excess of 1000 Wm^{-2}. It should be noted that bankfull discharge has no implicit notion of frequency, as the cross-section clearly relates to low recurrence interval events. Through the designated reach, the channel gradient is reduced by virtually an order of magnitude (0.056–0.006). The site is particularly interesting as the flow required for re-occupation of the flood channels and the re-mobilization of sediment is extremely high. Normal to moderate flows have little geomorphic impact, both in terms of flushing sediment through the system and reworking the floodplain. It is also a site at which the geomorphic persistence of landforms formed by the catastrophic 1829 flood in a high-energy environment can continue to be recorded.

The site is therefore valuable as a representative of a mountain torrent and exhibits well the effects of valley confinement, with contrasts in channel pattern between the upper, very narrow valley and the lower, much less confined part. It is also an important site in which the impacts of major, infrequent floods have been investigated and where their imprint on the landscape can still be seen.

Conclusions

The Luibeg Burn provides a good example of a high-energy channel system in an upland environment. In terms of rates of geomorphic activity, the system functions in a binary form, with long periods of quiescence punctuated by sudden bursts of sediment transport and floodplain reworking, associated with catastrophic flooding. Two such episodes are recorded in the contemporary literature (1829 and 1956) and demonstrate the extreme disruption and geomorphic persistence of land-forms associated with rare floods.

References



(Figure 2.37) Luibeg Burn. (a) Bouldery flood deposits (0.5–1.0 m b axes) reworked in the 1956 flood (flow direction towards camera). (b) A detail of the flood deposits, showing imbrication — flow direction right to left. (Photos: A. Werritty.)