Quoich Water Alluvial Fan, Aberdeenshire

[NO 119 906] L J. McEwen

Highlights

The lower Quoich Water alluvial fan, within the upper Dee catchment in Aberdeenshire, provides a classic example of a large, active, low-angle alluvial fan, the history of which reveals how such a landform adjusts its channel planform through time in response to flood events of different magnitudes and frequencies. This site possesses an exceptional documentary record with which to reconstruct the high rates of episodic reworking of the fan surface.

Introduction

The Quoich Water debouches from a long, narrow rock-controlled section cut in the underlying schist bedrock at the Linn of Quoich, a former meltwater gorge. With the removal of this confinement and a lowering of slope to 0.016 below this gorge, an active alluvial reach has developed upstream of the confluence with the mainstream River Dee. Glaciofluvial deposits stored within the floodplain upstream of the gorge and eroded from the adjacent slopes are periodically flushed downstream and deposited on the lower-angle alluvial fan.

Description

The present Quoich Water possesses a relatively stable alignment, immediately downstream of the Linn of Quoich, a bedrock gorge, affording a bridging point at the apex of the fan. In its upper reaches, the Quoich Water comprises an active wandering gravel-bed river, while on the lower fan it adopts a more sinuous course with the development of point bars. The sediments from the Quoich catchment are easily distinguished lithologically from those of the mainstream Dee at their confluence. There are numerous palaeochannels and bars on the fan surface which, on the basis of lichenometric dating, indicate reworking of the fan over the past 200 years. Research by McEwen (1986) has demonstrated that this reach has had a complex history of planform adjustment, which can be reconstructed over the past 150 years. There has been some repeated engineering work immediately downstream of the bridge. This has involved localized dredging of sediment from the main channel and its deposition to build up the channel banks artificially.

The sedimentology of the bed material and recent channel changes have been monitored by Maizels and compared with patterns on the mainstream Dee above and including the Dee/Quoich confluence. Patterns of change, particularly in sedimentary properties, have been linked to the flow characteristics of the site via a gauging station established on the lower Quoich in 1987 (Maizels, 1988). A good example of such investigations is the use of the Quoich fan to study the significance of obstacle clasts in cluster bedform dispersal and the role of floods in the reworking of such bedforms (De Jong, 1991).

Interpretation

The Quoich fan clearly reveals the impact of a major reduction in channel slope and confinement on a river system, characterized by readily accessible sediment sources and a flashy runoff regime. This site is especially interesting on account of the detailed reconstruction of the geomorphic impact of floods of different magnitudes and frequencies (McEwen, 1986). The most catastrophic event to occur in the catchment over the past 150 years (and probably longer) was that on 4 August 1829, during which, within a few hours, the entire fan surface became totally disrupted, with dramatic switching, dividing and excavation of channels (Lauder, 1830). Large amounts of sediment, primarily derived from upstream sources, were deposited across the fan. Further detail on the subsequent channel adjustment to this extensive flood sedimentation can be derived from the OS 10 560 maps of 1866, which indicate that the river no longer took a direct route across the fan; instead the flow infiltrated through the extensive sheet of flood gravels (Figure 2.44). By 1900, however, some of the 1829 flood deposits had been reworked by floods of lesser magnitude and the channel

planform had formed a dense reticulate network, thereby registering some adjustment to the extreme disequilibrium post-1829.

It is known from *British Rainfall* (1885) that another major flood occurred in August 1885, associated with a summer frontal storm. The 24 hour rainfall at Braemar was 87.4 mm with an estimated recurrence interval in excess of 100 years (McEwen, 1987). The resulting flood destroyed the Quoich bridge and reworked part of the fan surface. A large lochan, Lochan a' Chreagain, was now formed to the west of the floodplain. This flood did not, however, obliterate the effects of the 1829 storm. Analysis of maps and aerial photographs up to the present time has enabled the subsequent channel planform adjustment to be reconstructed as the Quoich attempts to attain a new equilibrium post-1829 (McEwen, 1986). The imprint of the August 1829 flood is still the most important land-forming event at this site, having reworked almost the entire fan surface with a lasting impact in terms of present fluvial activity.

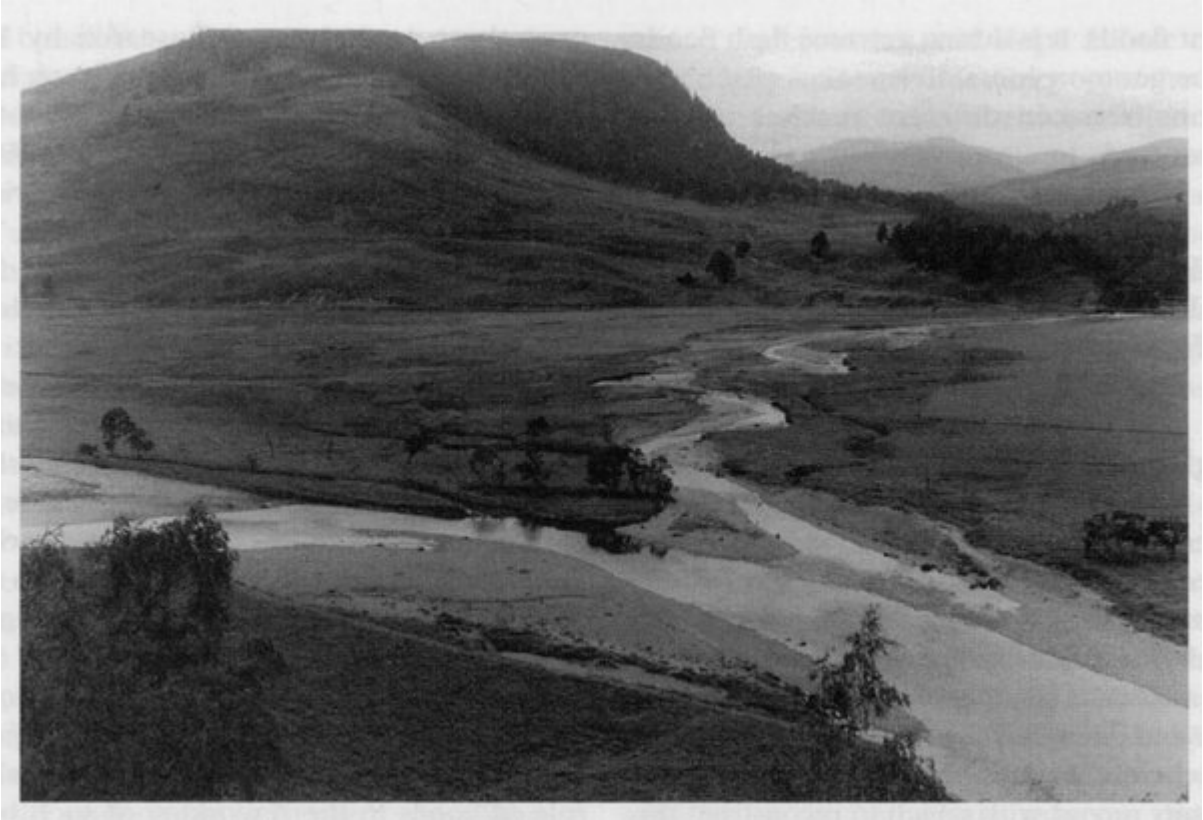
There has been some human interference in the processes responsible for the form of the fan. Near the fan apex, the channel planform is not entirely unaffected by human influence. There was a sawmill and lade upstream of the road bridge, originally built at the mouth of the Quoich in 1695 (Cordiner, 1780; Steven and Carlisle, 1959), but these were destroyed during the 1829 flood. Large regular palaeochannels at this point may be former lades, and such former major division of flow may have implications as to the geomorphic impact of historical floods when compared with present-day flooding. There has been also been some repeated dredging of the middle fan below Coronation Bridge. This may in part be responsible for the current instability in the wandering gravel-bed section.

The Quoich Water fan is an excellent, large and active example of a low-angle alluvial fan, of which there are several in Scotland. It exhibits particularly well the variation in morphology of channels and fan surface topography down the fan and the relationship between morphology and sedimentology in fans. The flood history is well-documented and allows the role of different sized events in the formation of such a feature to be evaluated.

Conclusion

The lower Quoich Water fan, within the upper Dee catchment, Aberdeenshire, provides a classic example of a confluence alluvial fan, common in upland Scotland. The site possesses an exceptionally good record of channel response to major floods, and allows an assessment of the roles of such events as the dominant landforming agents in this type of fan environment. It is rare that channel adjustment can be studied within a low-angle alluvial fan in such detail over a timespan of 150 years. This insight allows the current monitoring of present-day processes to be placed in a much longer temporal perspective than is usually possible.

References



(Figure 2.44) The Quoich Water alluvial fan. The currently unstable braided channel has been recently dredged. Palaeochannels from the 1829 flood are well developed on the fan surface to the left of the active channel. (Photo: A. Werritty.)