
Oldhamstocks Burn, East Lothian

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Highlights

Rapid mass-wasting and incision into thick till covers or weak bedrock are relatively common in stream headwaters across upland Scotland and northern England. This type of erosion is particularly well-developed in parts of the Southern Uplands, the headwaters of Oldhamstocks Burn providing an exceptional example.

Introduction

Incision into Old Red Sandstone conglomerates and their till covers by the headwater streams of Oldhamstocks Burn has locally produced a classic 'tadland' topography (Figure 2.50). During rare, high-magnitude storms, sediments are released by mass-wasting and debris flows from the slopes on to the valley floors where they form lobate sheets, around which the present-day streams pick a sinuous course. The most recent event capable of triggering large-scale mass-wasting was the August 1948 storm, during which many of the present valley floors were remodelled (Glasspoole and Douglas, 1949; Learmonth, 1950). Since that event, the slopes have become partially stabilized by the growth of vegetation, with the result that the slope and channel systems are now much more weakly coupled than during and immediately after that storm. The linkage between gullied slopes and valley floors has been investigated in other parts of the UK uplands (e.g. the Howgill Fells, north-west England, Harvey, 1992a, 1994). Oldhamstocks Burn provides an important site for further research into the long-term coupling of slopes and channels in small-scale river systems.

Description

The headwaters of Oldhamstocks Burn form the major part of the site and give rise to valley forms locally described as 'denes'. These streams, comprising Ling Hope, Wide Hope and Yearn Hope, rise on the summit plateau of the eastern Lammermuir Hills and flow in a north or northeasterly direction away from Monymut Edge (Wester Dodd, 412 m). They rapidly become incised into the underlying Old Red Sandstone, which locally is a conglomerate composed of well-rounded pebbles in a reddish, sandy and easily eroded matrix (Howell *et al.*, 1866). Within 600 m of its source, Yearn Hope records a maximum incision of 135 m, thus rapidly generating a pronounced 'V'-shaped cross-profile. The valley floors of all three streams are typically up to 50 m wide and have steep sides (20–30°) which provide many potential sites for rapid mass-wasting in the extensively exposed and highly erodible conglomerate. The overall geometry of these narrow headwater channels is related to meltwater incision during deglaciation in the Late Devensian. During this period, a thin cover of drift deposits was also laid down across the area.

Many of the valley floors are composed of poorly sorted, cobble-sized deposits, which often terminate in lobate margins. These deposits are particularly well-developed along the course of the Oldhamstocks Burn immediately downstream of the confluence of Ling Hope and Wide Hope. Throughout this reach the present stream is constrained to take a sinuous course around these irregular lobate sheets. Visual inspection of the lichens growing on these cobble-sheets suggests that the surface of much of the valley floor is probably not more than 50 years old.

Interpretation

It seems likely that the sheets of coarse-grained deposits on the valley floors are flood-derived materials that have been delivered from the steep-sided slopes by mass-wasting during particularly severe rainstorms. The lobate margins and irregular surfaces imply that they are debris flow or stony debris flow deposits rather than truly fluvial flood deposits (Wells and Harvey, 1987). The size of the lichens on these valley floor deposits strongly suggests that they post-date the

12 August 1948 storm, when c. 150 mm of rain fell over the Lammermuirs in 24 hours (Glasspoole and Douglas, 1949). This storm is known to have produced catastrophic flooding, slope erosion, and extensive deposition on valley floors throughout south-east Scotland (Learmonth, 1950; Werritty and Acreman, 1984), the neighbouring Monynut Water being particularly severely affected (McEwen, 1986).

Since the 1948 storm and a lesser one in 1956 (Common, 1958), the valley slopes have become increasingly stabilized by vegetation. As a result, none of the valley slopes at present is directly releasing sediment on to the valley floor. Thus, in marked contrast to the situation in the early 1950s, the slope and channel systems are now only weakly coupled. At several sites, notably in Yearn Hope, debris cones/alluvial fans have developed where tributary streams join the main valley. Since these fans and cones have deposits with lichens that are clearly much older than those post-dating the 1948 flood, it is clear that the development of the valley floor is locally complex and probably involves extreme storms extending back over many centuries (McEwen, 1989b, 1990). The system of mass-wasting on the hillslopes and the linkage between the slope and channel systems has much in common with investigations by Harvey (1992a, 1994) on the coupling of slope and stream systems in the Howgill Fells, north-west England.

This site is the best example in the Southern Uplands of a type of mass-wasting and erosion which is often found in the uplands of Scotland. A provisional chronology of recent episodes of rapid mass-wasting from these slopes suggests that the 1948 storm constitutes the main episode. This site is thus potentially significant in terms of recent gullying and valley floor development, and the coupling of slope and channel systems in headwater valleys.

Conclusions

This site comprises a group of three deeply incised headwater valleys which display both gullying and mass-wasting on a scale that is greater than that observed at any other site in Scotland. This type of erosion is relatively common in those parts of upland Scotland and northern England where headwater streams have incised into thick drift covers or weak bedrock. There are many such sites in the Southern Uplands, of which this is the best example.

References



(Figure 2.50) Oldhamstocks Burn. Active gullies producing 'badland' topography in Yearn Hope valley. (Photo: A Werritty.)