
Chapter 4 Mass-movement sites in Devonian strata

Introduction

R. G. Cooper

In Great Britain 1042 landslides are reported in Devonian strata by Jones and Lee (1994), of which almost three-quarters (75%) are of unspecified type. However, of those for which the type has been identified, the largest group is rockfalls, at 41%, followed by translational slides and debris flows at 31%. Two GCR sites have been selected in Devonian strata, Coire Gabhail in Scotland, and Llyn-y-Fan Fach in Wales (see (Figure 4.1)).

Rockfalls are a commonly recognized form of mass movement, but there is usually little evidence of the processes that have brought them about. There are several possibilities, including:

1. Frost-wedging in rock fissures: could cause a detached block to stand proud of a cliff-face to such an extent that its centre of gravity causes sliding under its own weight and eventual falling as the block becomes free of the restraint of the adjacent rock body. Dislodgement of one fragment could provide conditions for fragments above it, and possibly the whole cliff, to collapse.
2. Weathering: could cause a decrease in cohesive strength so that a cliff-face could disintegrate into a large number of fragments.
3. Undercutting of the cliff-face: could remove basal and lateral support.

Either way, the resulting form consists of a pile of fragments described as *talus*.

Where rockfall occurs on a rectilinear slope, a talus sheet is produced at its foot. However, where rockfall repeatedly takes place into a rock gully, the gully will constrain the path of the fallen debris, giving rise at the gully's mouth to a talus cone. Laterally adjacent cones may coalesce to form a sheet.

Ballantyne and Harris (1994) define a talus slope as a steep valley-side slope formed by the accumulation of debris at the foot of a rockwall. The term 'talus' is used to denote both the slope and its constituent material. *Scree* is taken to refer to any slope that is covered in coarse debris. Therefore 'scree' includes 'talus', which is more closely defined.

Rockfall talus characteristically may display fall-sorting, a process whereby larger fragments come to rest farther downslope than smaller fragments (Ballantyne and Harris, 1994). Grain size is commonly bi-modal, which can result in talus sliding, and sorting into garlands and stripes. This in turn imparts another characteristic to talus slopes: in profile, a talus slope lessens in steepness at its foot. This is because at the foot the talus slope consists of the largest fragments, which protrude most from whatever lies beneath the surface (usually talus from previous falls), although it can also be because the debris runs out and rests on the valley floor. This characteristic is absent from the famous talus of Wasdale, in the English Lake District, because the lower parts of these are underwater in the lake that occupies much of the glacially over-deepened valley.

Sliding may take place on a talus slope — dry and granular sliding by debris slide, or avalanche gullying. A widespread process by which debris is re-distributed on a talus slope is debris flow. The term is primarily used to refer to rapid downslope flow of poorly sorted debris mixed with water, but it is also used to refer to the suite of landforms produced by an individual flow. The overall effect of debris-flow activity on talus is that material is eroded from the upper part of the talus slope and deposited near or beyond the talus foot. In this way the overall gradient of the talus slope is reduced, and a long, sweeping basal concavity is produced. Debris flows disrupt the fall-sorting of undisturbed rockfall talus. Repeated flows on the same track produce a gully in the upper part of the talus slope, which is continued downslope by two parallel debris levees that mark the path of the flow and terminate downslope in one or more lobes of bouldery debris.

The GCR sites (Figure 4.1) chosen to represent some aspects of these features include the site of a very large post-glacial rockfall, Coire Gabhail in Glencoe, Scotland, for which the evidence is a talus of great coarseness, and

Llyn-y-Fan Fâch in Carmarthenshire, Wales, where there are debris flows that have been investigated as a potential exemplar of an alternative explanation of the steepness of talus slopes (Statham, 1976).

[References](#)



(Figure 4.1) Areas of Devonian strata (shaded), and the locations of the GCR sites described in the present chapter.