Eglwyseg Scarp (Creigiau Eglwyseg), Clwyd

[SJ 235 432]–[SJ 235 480]

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Introduction

Eglwyseg Scarp extends 8 km northwards from Castell Dinas Brân near Llangollen see (Figure 5.3) and (Figure 5.4). It faces westwards and is divided into a series of buttresses by deep gully dissection. The site has frequently been quoted as a type example for escarpments and screes, but it differs markedly in both form and history from many others in upland Britain.

Tinkler (1966) identified two distinct types of depositional slope below the free face. He used the term 'clitter' to describe a thin veneer of coarse rock fragments on a slope, the form of which is controlled by underlying structure, and reserved the term 'scree' for loose fragments in an accumulation of sufficient depth for the angle of repose to be determined by the physical characteristics of the fragments themselves, as distinct from its being determined by whatever lies beneath the accumulation of fragments.

The outcrop of the Lower Grey and Brown Limestone coincides with that part of the escarpment below the most significant free face (Figure 5.5). It is characteristically composed of limestones 0.62–0.9 m thick, with intercalated shale beds (5–15 cm), and forms a stepped lower bedrock slope. The Middle White Limestone is lithologically distinct and forms the free faces. It is composed of three massive beds about 7.5 m, 13.5 m and 6 m thick respectively, separated by narrow shale beds that are locally absent. Lateral variations in thickness are considerable, with a general thinning towards the south. Above this are several low and degraded scarps in the Upper Grey Limestone and Sandy Limestone.

Description

The escarpment seems to have been initiated at a time when the River Eglwyseg joined the River Dee near Castell Dinas Brân, at about 300 m above OD. Local slopes indicate this drainage trend, and a terrace is preserved below the scarp at Craig Arthur. Some time in Early Pleistocene times the River Eglwyseg was diverted westwards, so that slopes south of the Dinbren Isaf col have since developed without a river to facilitate transportation or erosion (Tinkler, 1966). They appear to have declined, aided by the southward thinning of the Middle White Limestone. An extensive mantle of Devensian till covers the uplands and is also found in the deeper fissures on the scarps, on the inter-scarp ledges and on the main slopes below. During deglaciation, meltwater and periglacial activity re-deposited some of this as head, and upper deposits are common along the foot of the main escarpment (Figure 5.6).

Local slopes indicate the former drainage trend of the proto-Eglwyseg and a terrace is preserved below the scarp at Craig Arthur. Incision below this valley was considerable at the Dinas Brân and Dinbren Uchaf cols before diversion of the River Eglwyseg, an event still marked by an elbow bend in solid rock.

The slopes south of the Dinbren Isaf col below Creigiau Eglwyseg (Figure 5.6) are the closest to the line of the proto-Eglwyseg. To the north, where incision at the elbow of diversion is 90 m lower, the escarpment has retreated further, and the greater available height between the river and the slope crest (270 m compared with 150 m at Trefor Rocks) permits greater horizontal retreat of the upper cliff before complete decline. The latter stage is approached at Eglwyseg Mountain and Creigiau Eglwyseg. Pin fold Buttress, which shows least sign of decline, is opposite the elbow of diversion. At Trefor Rocks the slopes are in a degraded state, while Craig Arthur in the north has been protected in part from erosion by a terrace in front of it. This buttress lies to the front of the general line of the escarpment. The presence of till below scree and diner on all parts of the escarpment indicates that the basic morphology dates at least to the last (Ipswichian) interglacial, with only minor modification since then. The debris cover is therefore a shallow mantle on a fossil bedrock form partly buried by till. Its accumulation can have had little influence on the. form of the bedrock slope below the free face or upon the free face itself (Milder, 1966). Jointing is variable, but deep cracks in the free face can produce huge tabular blocks that become embedded in the scree. Normally, fine surface cracks and joints in the free face have given rise to scree debris up to 30 cm maximum dimension.

The tallest free face is always in the White Limestone, and the scree, clitter and bedrock slopes below are developed in the Lower Grey and Brown Limestone, while the scree-slopes above are in the Upper Grey Limestone and the Sandy Limestone. Variations in lithology are minimal on different parts of the slope. Scree counts were made by Tinkler (1966) on the lines of profile at random intervals, and sizes refer to the maximum dimension of each of a sample of 100 pieces. The scree and slope type-data are restricted to the main slope of the scarp below the lowest free face, and the profiles are entirely limited to the limestone outcrop. The lower limit of profiles is that of loose debris, which is the upper limit of enclosure.

Tinkler (1966) surveyed 56 slope profiles at intervals along the length of the escarpment (Figure 5.7), (Figure 5.8), (Figure 5.9). Substantial scree-slopes are restricted to three localities: World's End, Craig Arthur and the south-west face of Pinfold Buttress. scree-slopes elsewhere are short and impersistent. In total the Eglwyseg scarp-face area is 28% scree, 11% bare bedrock, 11% grassed scree and bedrock, and 50% clitter (Tinkler, 1966). The term 'clitter' is used in vernacular English to describe either a slope composed entirely of rock clasts that litter the surface and have been derived from the runout of rockfall debris or a rock litter derived from rock weathering, the core stones being stripped of their matrix to leave the boulder field. Scree is present on the north side of the World's End valley, and the slope length increases 30 m to 75 m westwards along a baseline 129 m long. Nine profiles and 24 scree counts were made here. 54% were in the range 5–13 cm, 25% in the range 13–20 cm, and 3% were over 20 cm. 80% of the scree is between 5 cm and 20 cm in size. The percentage of the sample recorded at 5–13 cm decreases downslope, while the percentage recorded at 13–20 cm increases downslope. Scree over 20 cm is limited to the bottom of the profile but is significantly related to slope position at the 1% level. Scree below 5 cm is barely represented in most of the samples. Coarser scree is present below the fine scree at a shallow depth, and occasionally overloading of fine scree at the top of the slope has caused it to spill downslope as a narrow trail, the lower end of which is built up at a slightly lower angle (32°–33°).

At Craig Arthur the slope cover of scree and clitter increases southwards, and on the most northerly facing slope there is no surface debris on a bedrock profile of 30°–33°. Elsewhere scree is present as a relatively narrow band above the lower clitter slopes. The increasing scree and clitter slope cover southwards, despite the almost constant height of the free face and increasing slope length, suggests differential weathering in the post-glacial period. Total scree percentages are similar to those at World's End: 18% with maximum diameter less than 5 cm, 66% between 5 cm and 13 cm, 13% between 13 cm and 20 cm, and 3% over 20 cm. However, at Craig Arthur much of the fine material low on the profiles is derived from the underlying till by surface washing. Clitter angles are all markedly lower than scree angles.

On the south-west side of Pinfold Buttress 11 scree counts were made, and similar proportions of scree sizes were recorded: 15% with maximum diameter less than 5 cm, 63% between 5 cm and 13 cm, 19% between 13 cm and 20 cm, and 3% over 20 cm. The fairly constant proportions at three different sites seem to highlight the constant lithology of the free face.

The distribution of bedrock angles is significantly higher than the distributions of scree or clitter, and this partly depends on the masking effect of the scree and cutter on the lower-angled bedrock slopes. However, where exposed on the lower slopes, bedrock slope is nevertheless steep (over 35°) (see (Figure 5.9)).

Interpretation

In general the pattern is for a clitter slope to occur below a free face of bare bedrock. Parts of the clitter slope may be grassed over. At World's End, Craig Arthur and Pinfold Buttress, a scree-slope is interposed between the free face and the clitter slope. The order 'free face–scree–clitter' applies to many of the smaller free faces above and set back from the main free face. The upper levels of the scree-slopes may be grassed.

Particle-size counts (Tinkler, 1966) of scree from the three main sites indicate that about 80% of scree particles have sizes (presumably *b*-axis) between 5 cm and 20 cm, and that particle-size proportions are fairly constant between sites.

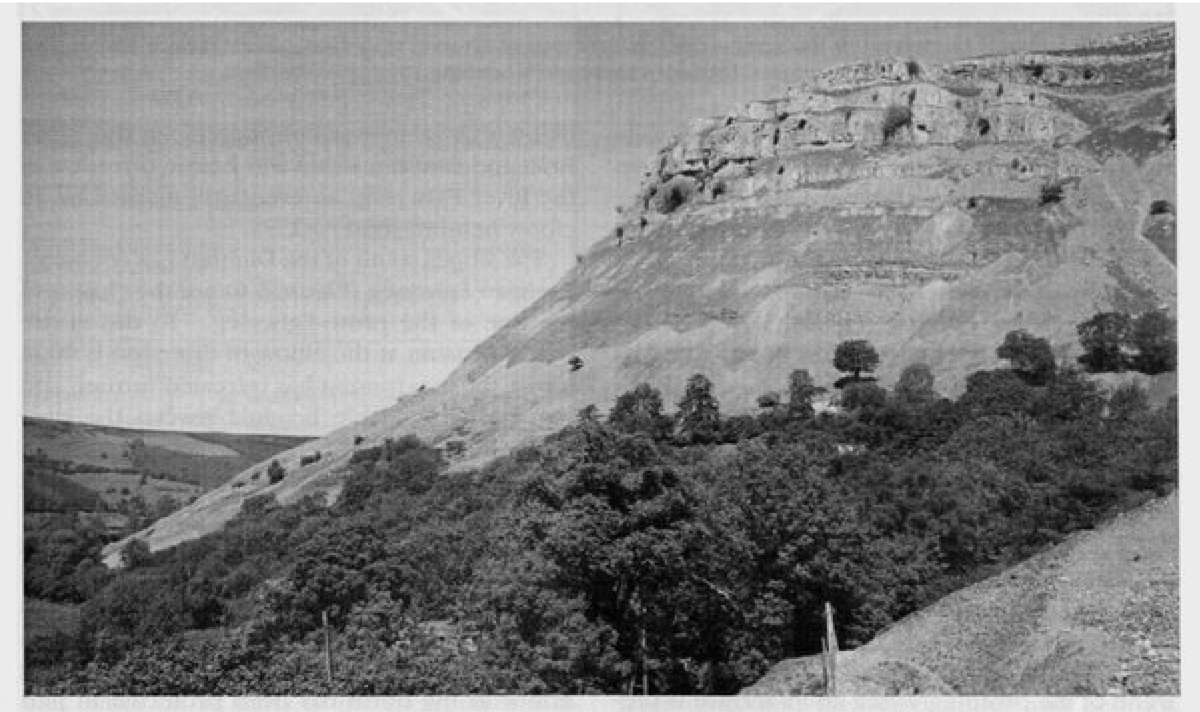
At all three sites, fall-sorting is evident, with the smallest particles most frequent at the top of each scree run, and the largest at its foot. Talus creep and surface wash also affect the distribution, particularly where long clitter slopes are present and the till is near the surface, as at Craig Arthur and Pinfold Buttress. scree-slopes have only developed where there is a substantial free face. They are currently active, and only stabilize where a thin soil covers the uppermost part, as at World's End.

The range of slope angles recorded on the screes is only 6°–7°, clustering around a modal value of 35° (Figure 5.9). In contrast, the modal angle on bedrock (excluding the free face, which generally stands at more than 50°) is 38°, with a very definite upper limit of 40° (upper semi-quartile). This limit is taken as an indication (Tinkler, 1966) that the bedrock slopes may have developed as a Richter slope in relation to a debris cover which no longer exists. They clearly represent the 'buried face' of Wood (1942), but the morphology is not always clear: the form is essentially exhumed, with only very minor convexity. Till is always found at shallow depth beneath the cutter on the cutter slopes, and the angles on it reflect this: the modal angle is about 32°. This suggests that the clitter may be a residual deposit resulting from the washing out of till. Clitter can grade upslope into scree but the junction is usually sharp.

Conclusions

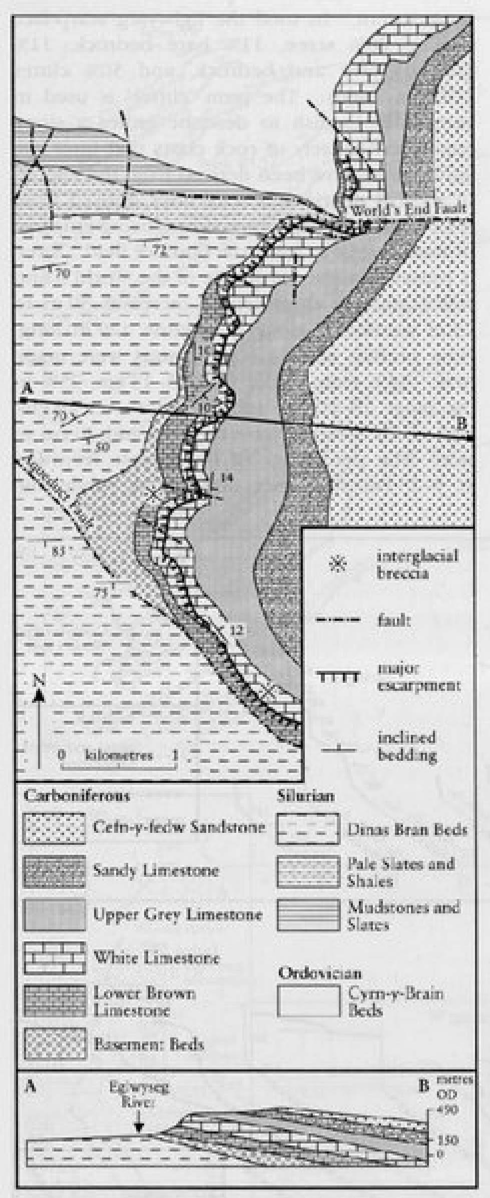
As noted by Tinkler (1966), post-glacial erosion and deposition at Eglwyseg Scarp has been a mere etching upon a morphological framework inherited from late Tertiary and Pleistocene times. For this reason, expressed mainly through the prevalence of clitter slopes, the depositional slopes at Eglwyseg cannot be regarded as true scree-slopes like those of Snowdonia, the English Lake District or the Cuillins. It is this unusual aspect of their nature that makes them particularly appropriate for conservation.

References

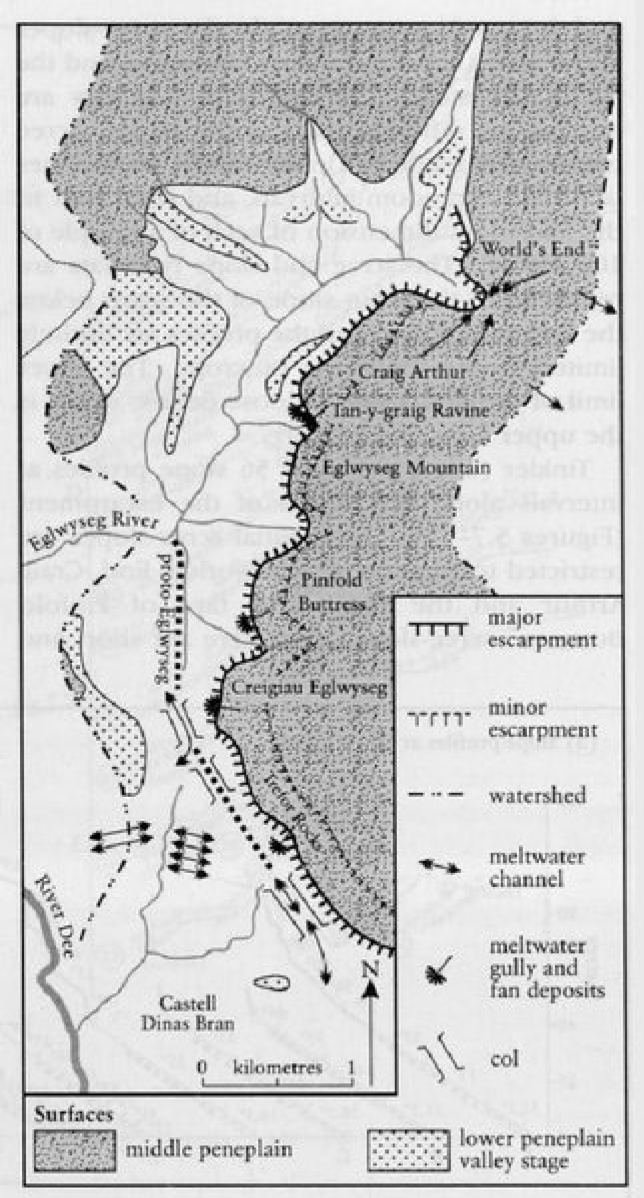


(Figure 5.3) View of Eglwyseg Scarp, surveyed by Tinkler (1966). (Photo: R.G. Cooper.)

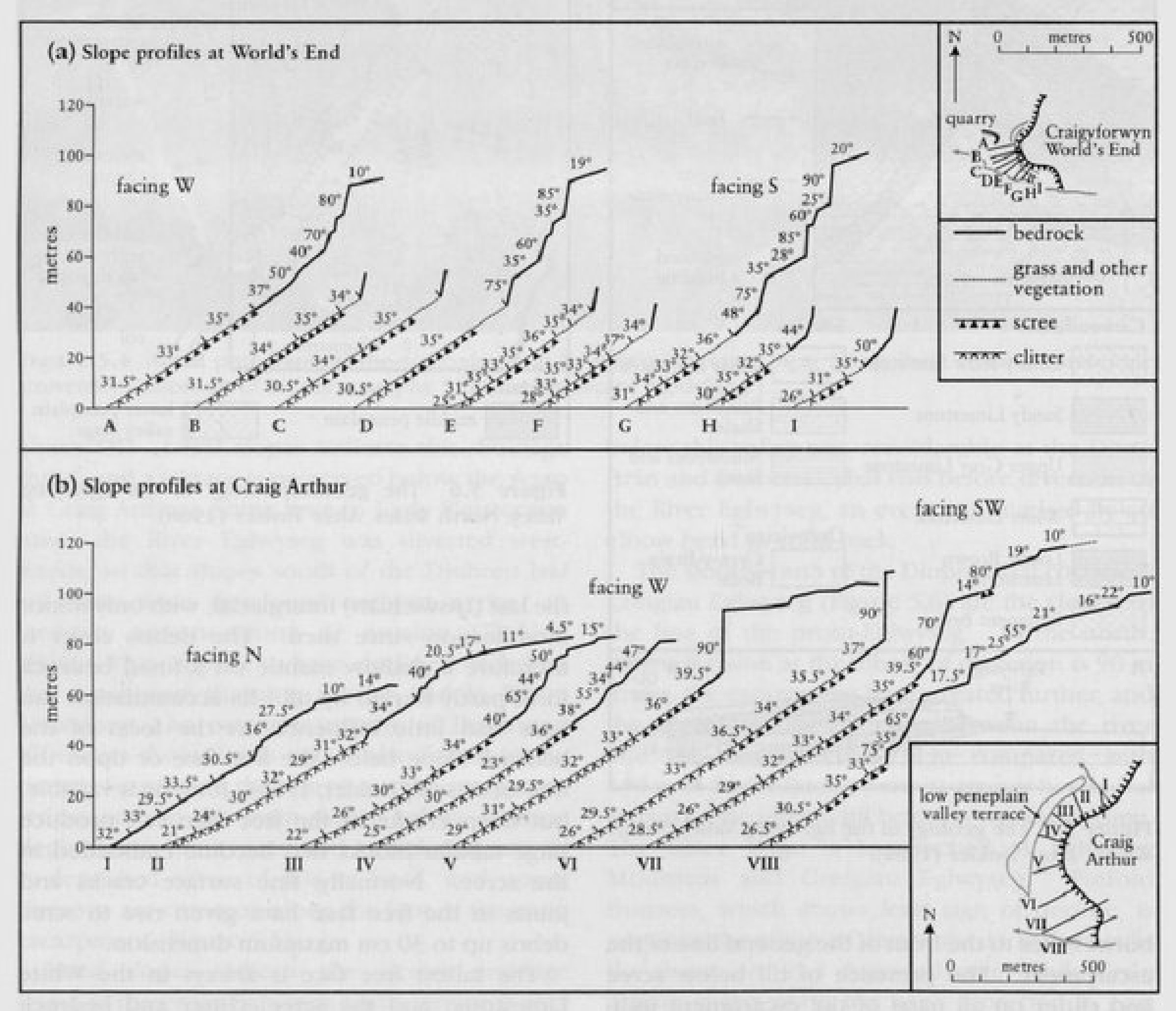
(Figure 5.4) Aerial phtograph of the scree-slopes at Eglwyseg Mountain, near Llangollen. (Photo: Cambridge University Collection of Air Photographs, Unit for Landscape Modelling.)



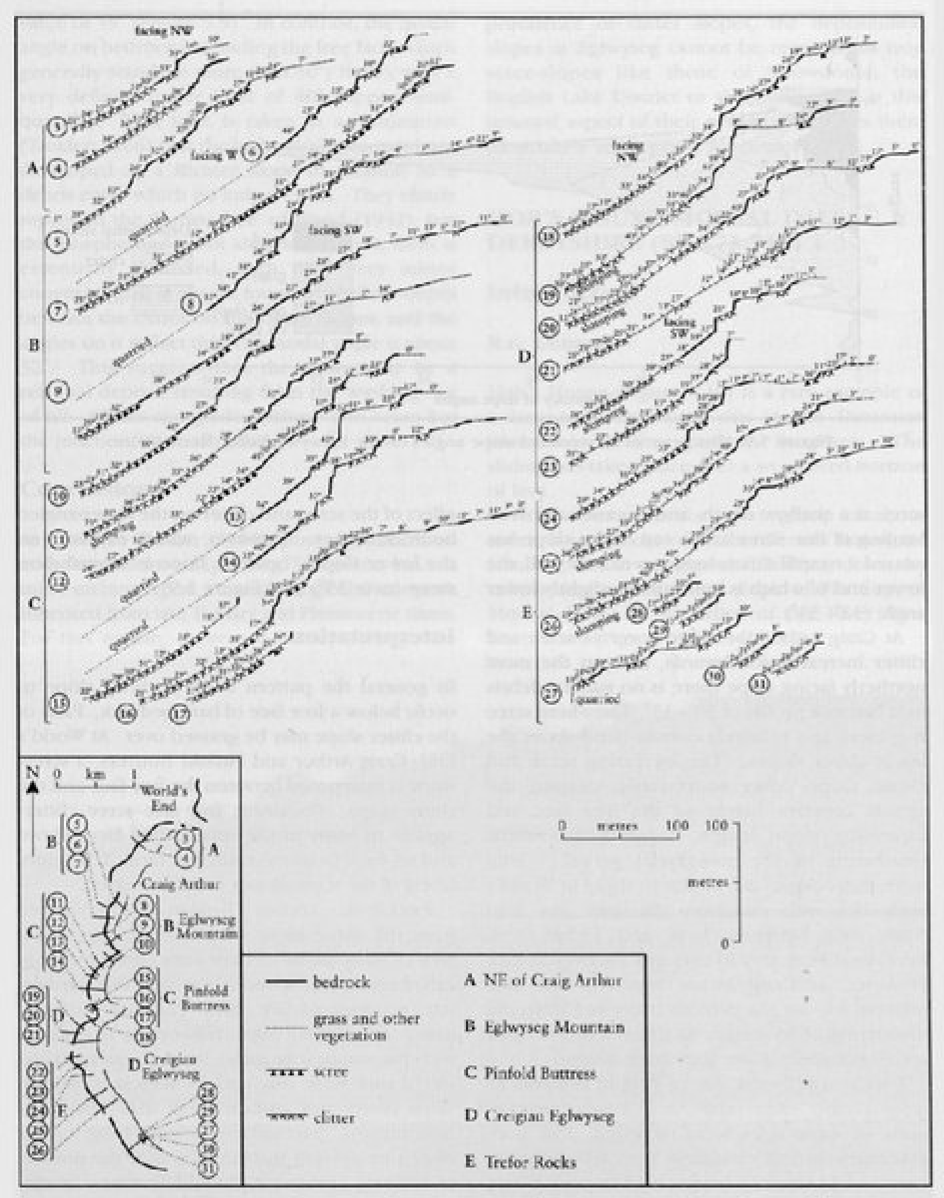
(Figure 5.6) The geomorphology of the Eglwyseg Valley, North Wales. After Tinkler (1966).



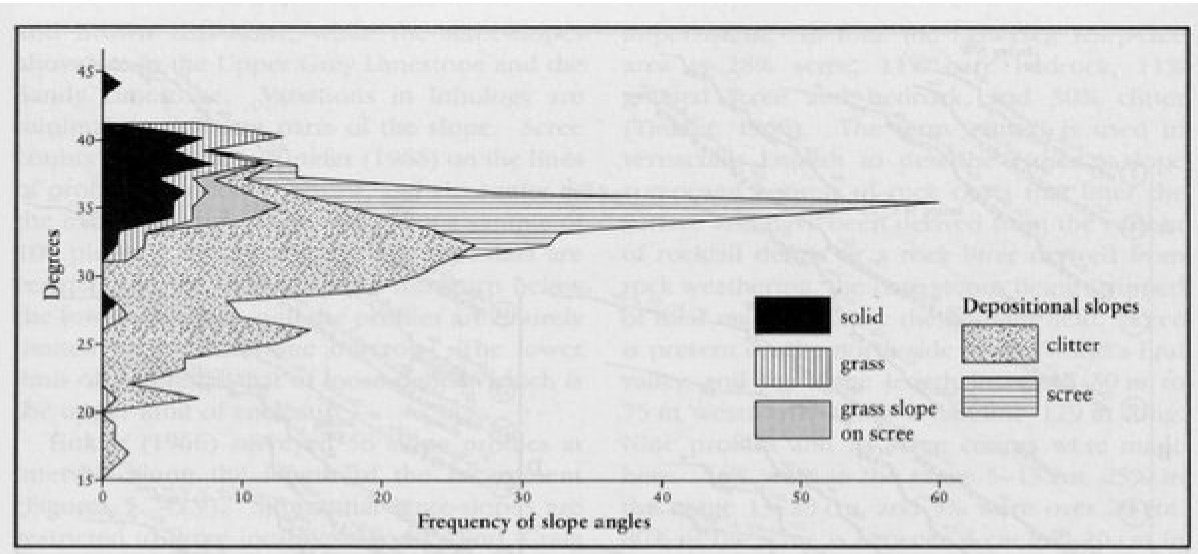
(Figure 5.5) The geology of the Eglwyseg Valley, North Wales. After Tinkler (1966).



(Figure 5.7) Slope profiles of (a) World's End, and (b) Craig Arthur. After Tinkler (1966).



(Figure 5.8) Slope profiles on Eglwyseg Scarp, North Wales, surveyed by Tinlder (1966).



(Figure 5.9) Histogram of all recorded slope angles on the Eglwyseg Valley, North Wales.