Somerset slides

Unravelling the history of unstable slopes in the Blackdown Hills

by Richard Ellison, Andy Gibson and Michael Hall

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The Blackdown Hills, on the Somerset–Devon border, rise abruptly 200 to 250 metres above the low lying area known as Taunton Deane. The escarpment at the edge of the hills is formed by the Upper Greensand, capped by a residual deposit of gravel and clay derived from a former cover of the Chalk and Tertiary sediments. Much of the land at the foot of the escarpment is saturated by spring water emanating from the base of the permeable Upper Greensand. These permeable beds overlie a number of relatively impermeable clay-dominated geological units, including argillaceous strata at the base of the Upper Greensand sequence. An unconformity at the base of the Upper Greensand means that it lies on progressively younger strata, from Mercia Mudstone in the west to Charmouth Mudstone in the east. The slopes above and below the spring line are extensively affected by landslides, although hitherto the extent and nature of these landslides and other associated superficial deposits have not been studied. As work has progressed it has become apparent that the area provides an interesting insight into mass movement processes beyond the limit of glaciations in the UK.

Current mapping of the Blackdown Hills area forms part of our Integrated Geoscience Surveys programme which also includes a strategic element to improve the mapping of landslides and cambered ground in the Cotswold Hills. The Urban Geoscience and Geological Hazards programme's landslide project team is working with the mapping team to advance the understanding of landslide processes on a local and national basis and to enter the newly recognised landslides into the National Landslide Database. The work is being supported by several innovative techniques, such as digital terrain modelling and aerial photograph interpretations using computer-based three-dimensional visualisations. The work is enabling us to construct slope models across the region *(opposite)* to establish what landslide processes are present and where they are most likely to occur.

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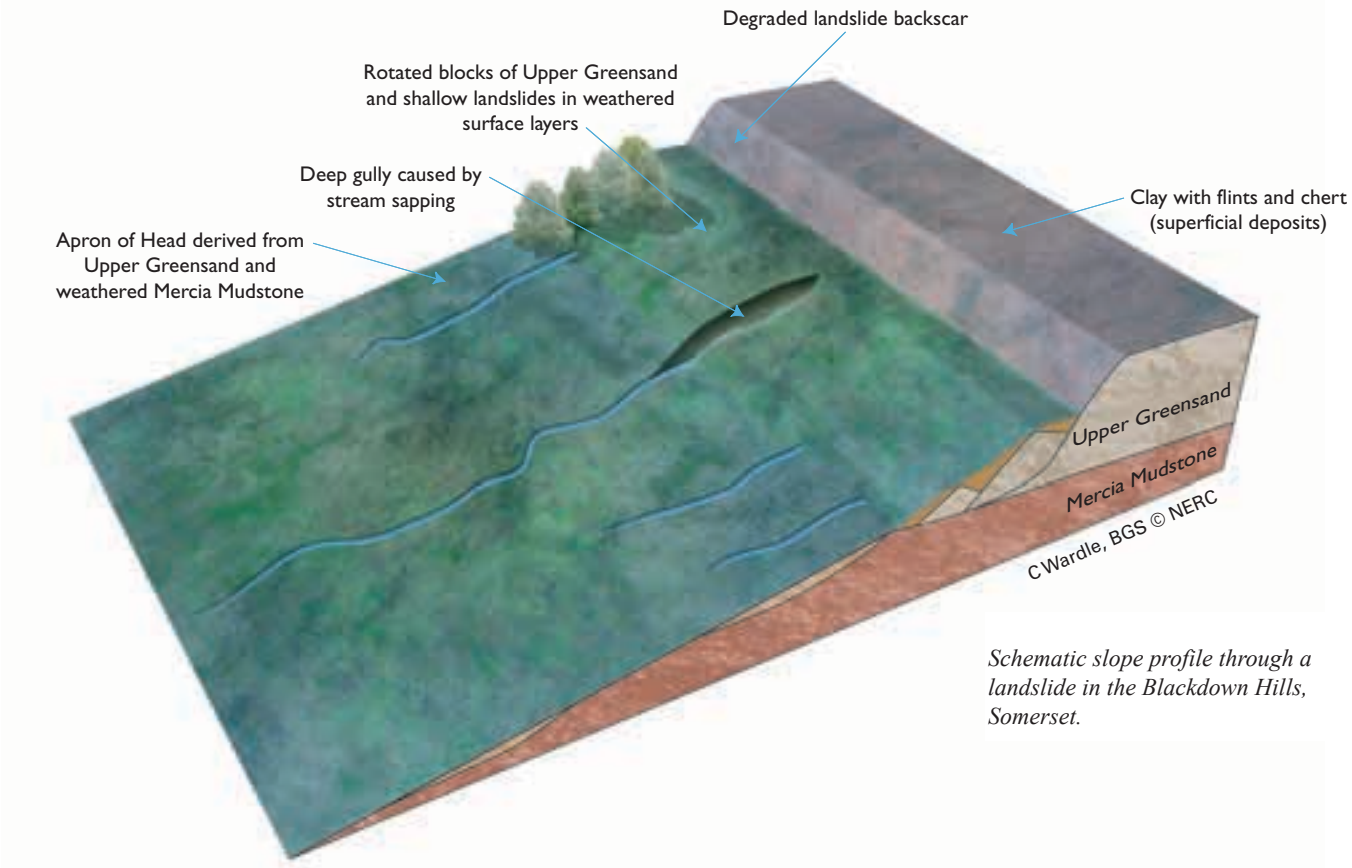
Recording the details of a recent landslide in the Blackdown Hills, Somerset.

Using the digital photogrammetric workstation, air photo stereopairs are viewed in their correct three-dimensional geographical space, allowing landform features to be digitised with accurate x, y and z co-ordinates. Approximately eighty 1:25 000 scale air photos were processed for this study. The system has been used as a method for targeting fieldwork to specific areas where landsliding is more



Schematic slope profile through a landslide in the Blackdown Hills, Somerset.

prevalent, and for directly mapping larger lobe and backscarp features.

Most landslide features are characterised by hummocky topography at a scale of between one metre and one hundred metres. The landslides are mostly inactive and degraded by erosion, but it has still been possible to identify examples of ancient rotational and translational slides and flows. Derived from, and transitional with, the landslides are deposits of Head. These generally occur downslope of the landslides, give rise to relatively featureless planar to concave slopes, and consist of chert gravel (derived from the superficial deposits on top of the escarpment) mixed with fine to medium grained sand (from the Upper Greensand) and variable amounts of other reworked local bedrock.

The cause of the landslides and the type of ground failure varies, depending on the geomorphology and lithological sequence. Where the Upper Greensand overlies Mercia Mudstone, landslides are mostly confined to the Upper Greensand outcrop, whereas in areas where Lias clays occur beneath the Greensand there are far more extensive areas of sliding. In both cases the style of landslides is dependent on whether the escarpment is straight or indented. Where there is an active spring line on a straight length of escarpment, landslides tend to be in the form of shallow non-circular slumps in the Upper Greensand above the spring, and shallow flows of sand and clay below the spring. Where the escarpment is indented, there appears to be a greater tendency for relatively large-scale rotational failure of the deposits below the spring line, particularly the Lias clays.

The development of the distinctive escarpments in the Blackdown Hills has taken place over millions of years but much has yet to be resolved in understanding its evolution, in particular the role of landslides and climate change. For example, when frozen ground of periglacial conditions thawed, temperate conditions will have brought about changes in groundwater flow that must have had a significant acceleration of the landsliding process.

More recently minor climatic variations, such as the Little Ice Age, and human modification of the landscape, such as deforestation, may also have played a part in the development of the escarpment and its associated landslides. ▮

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