Bleaklow, Derbyshire

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Highlights

The high moorland areas of the southern Pennines have some of the highest rates of peat erosion in the UK. Erosional activity, which dates from the formation of the peat blanket, has produced a number of different morphological responses. While climatic adjustments may have been responsible for historical degradation, human impacts may have increased recent activity.

Introduction

Many of the peat deposits of the southern Pennines are undergoing recent erosion, creating a number of morphological features (Figure 6.31). A number of factors has been suggested as causing the erosion, including: the natural instability of rapidly growing peat under deteriorating climatic conditions, (Conway, 1954); climatic variability (Tails, 1985); the influence of biotic factors (Bower, 1962; Radley, 1962); the effects of slope (Radley, 1962); inheritance of stream characteristics developed under different climatic and ground surface conditions (Johnson, 1957); air pollution (Tanis, 1965); and moorland fires (Tails, 1987).

Description

A number of morphological classifications of peat erosion have been put forward. Bower (1960, 1961) suggested two types of gully erosion on the peat, Type I dissection by gully and sheet erosion of flat areas in a close network, and Type II being less intensive with gullies occurring on sloping ground, forming sub-parallel trenches. Radley (1962) proposed an alternative classification of grains and groughs, peripheral erosion, sub-peat erosion and summit erosion. Grains and groughs are tributary channels and gullies that have cut between peat mounds isolated by erosion and causing stream head retreat. Peripheral erosion at the edge of the bog is caused by sheetwash, although Conway (1954) and Bower (1960) have attributed this form to bog-burst and to slump respectively. Sub-peat erosion occupies tunnels in the peat and open joints in the gritstone and may be downstream of minor grains.

Finally, summit erosion is characteristic of deeply dissected plateau areas. Tallis (1965) combined these typologies into stream erosion (which included U- and V-shaped cross-sectional gullies), summit erosion and marginal recession.

Bower's classification has been debated and used in a number of studies (Mosley, 1972; Tallis, 1985, 1987). Mosley (1972) tested Bower's classification on the streams and gullies draining Bleaklow. By measuring the number of first order tributaries, the total length of channel, the basin area, the maximum straight-line length and the width of the basin, Mosley (1972) concluded that while good examples of each type can be found, these tend to be at opposite ends of the spectrum. Difference in patterns can be attributed to natural variance, as only when there are gross differences in slope can the flow patterns be superficially distinctive. However, random simulations of straight, concave and convex slopes produce patterns similar to the actual stream system on Bleaklow (Figure 6.32). Tanis (1985, 1987) identified Type I and II gullies on Featherbed Moss (at the headwaters of the River Ashop) and Holme Moss. However, these different gully systems may have developed at different times.

A conspicuous feature of the recent phase of erosion has been the rapid extension of streams back into the peat blanket (Radley, 1962). Moss (1913) calculated a general 3/4 mile extension between the Ordnance Survey editions of 1830 and 1870, and a further 1/4 mile by the 1912 re-survey. There are few areas where the opposing headwaters have not reached the summits and dissected the interfluve. Howden Moor on Bleaklow is typical of this general condition and, in such an active environment, headwater captures have been identified (Pugh, undated); for example, the headwaters of the Derwent have been captured from those of the River Little Don.

Interpretation

The peat erosion on the high peaks has been attributed to a number of factors, including natural processes, human activity, biotic factors, air pollution and climatic change (Moss, 1913; Conway, 1954). The natural instability of the peat has been considered to be instrumental in causing erosion, as in some areas erosion may be an intrinsic property of the peat (Bower, 1961). Once exposed, lateral erosion by wind action may occur on exposed ridges.

Biotic factors have also been proposed for initiating peat erosion where destruction of plant cover exposes the peat blanket to the elements (Radley, 1962). Overgrazing by sheep, development of pack horse trails, and World War One manoeuvres also have been blamed for exposing the peat (Radley, 1962). However, these factors may not initiate erosion but prevent colonization (Tanis, 1985).

Microfossil and macrofossil analysis at nearby Holme Moss concluded that the erosion had been produced by exceptional events (Tanis, 1987). The clearance of the forests around Holme Moss in the 11th century resulted in the formation of well-defined stream channels but the drier climatic conditions early in the Middle Ages led to the subsequent lowering of the water table followed by climatic deterioration in the 18th and 19th centuries. Moorland fires and a cloudburst in July 1777 may both have accentuated existing erosional features (Tallis, 1987).

Atmospheric pollution may have contributed to recent erosion (Falls, 1964). However, in the case of Holme Moss it was already established by the time of the industrial revolution (Falls, 1987).

Climatic conditions represent a control on rates of erosion and can be used as a backdrop to evaluating the temporal changes in erosion. For example, on Featherbed Moss, pollen diagrams and radiocarbon data have been used to provide a chronology for the evolution of peat erosion (Tallis, 1985). Four climatic regimes in (Figure 6.33) are illustrated: CR-1, 2800–5700 BP, when peat growth was slow; CR-2, 1600–2800 BP, in which peat accumulation increased in the wetter climate; CR-3, 400–1000 AD, associated with rapid peat growth; and CR-4 initiated since 1000 AD, a slower growth phase. Two periods of peat erosion have been identified, one initiated 1000–1200 years ago and the other 200–300 years ago. The first of these may have been responsible for gully development, which was then checked during the wet phase at the end of CR-3. Tallis (1985) has attributed this activity to naturally induced mass movement, with marginal areas of the peat blanket drying out. The second phase of erosion is more recent and currently active through biotic and human activity, and has less to do with climatic influence. Some of the Type I gullies produced by the first phase of activity may have remained bare ever since; Type II gullies and marginal erosion may have been recolonized and only recently shown renewed erosion; and some gully systems may have originated only in the past 200–300 years.

Recently, Heathwaite (1993) has discussed the impact of climatic change on British peatlands. Increased precipitation may encourage peat formation but may also lead to greater erosion, so the position of the peat water table will therefore be critical in the future stability of peatland ecosystems.

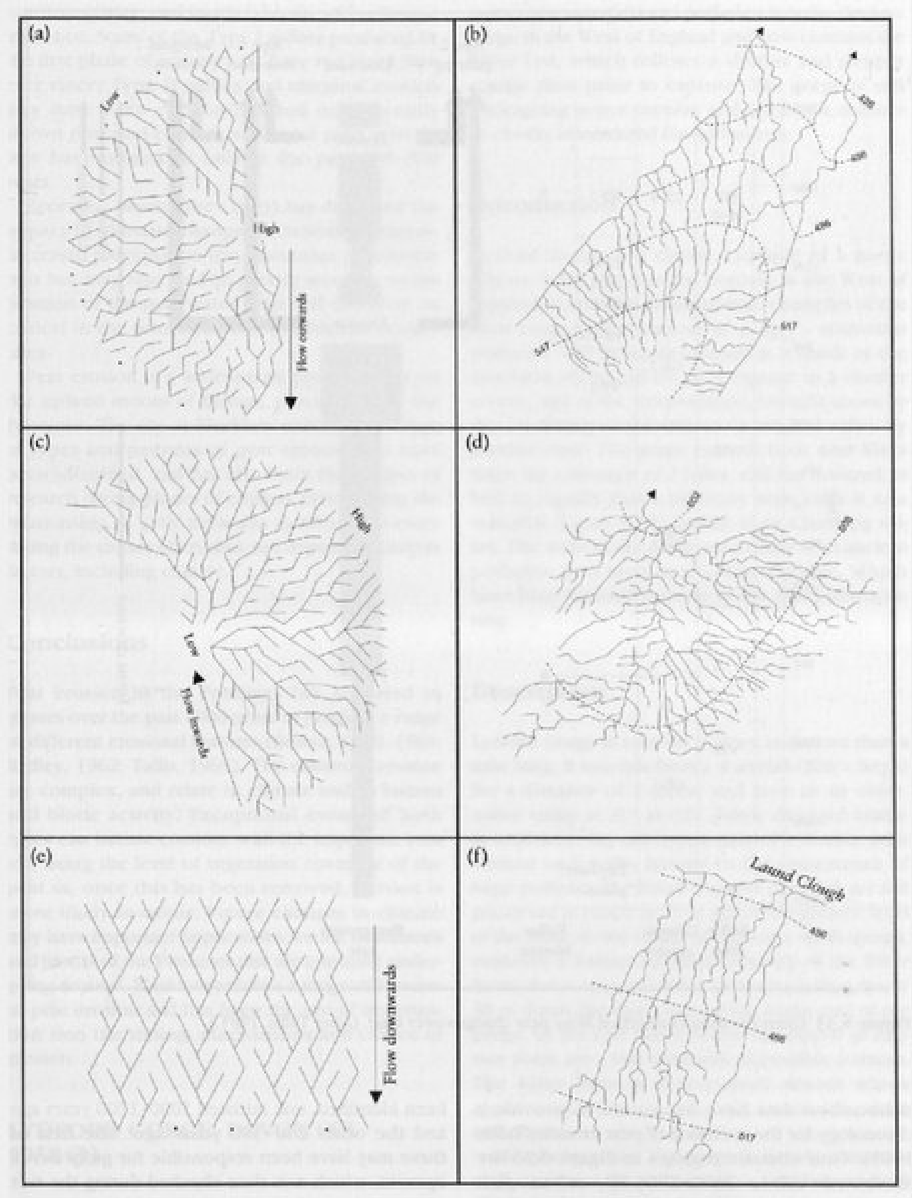
Peat erosion is a widespread phenomenon on the upland moors of Britain, particularly in the Pennines. The site at Bleaklow exhibits the range of types and patterns of peat erosion that have been identified, and has also been the subject of research dating phases of erosion, investigating the relationship of gully networks to slope, and elucidating the causes of erosion and impacts of various factors, including climate.

Conclusions

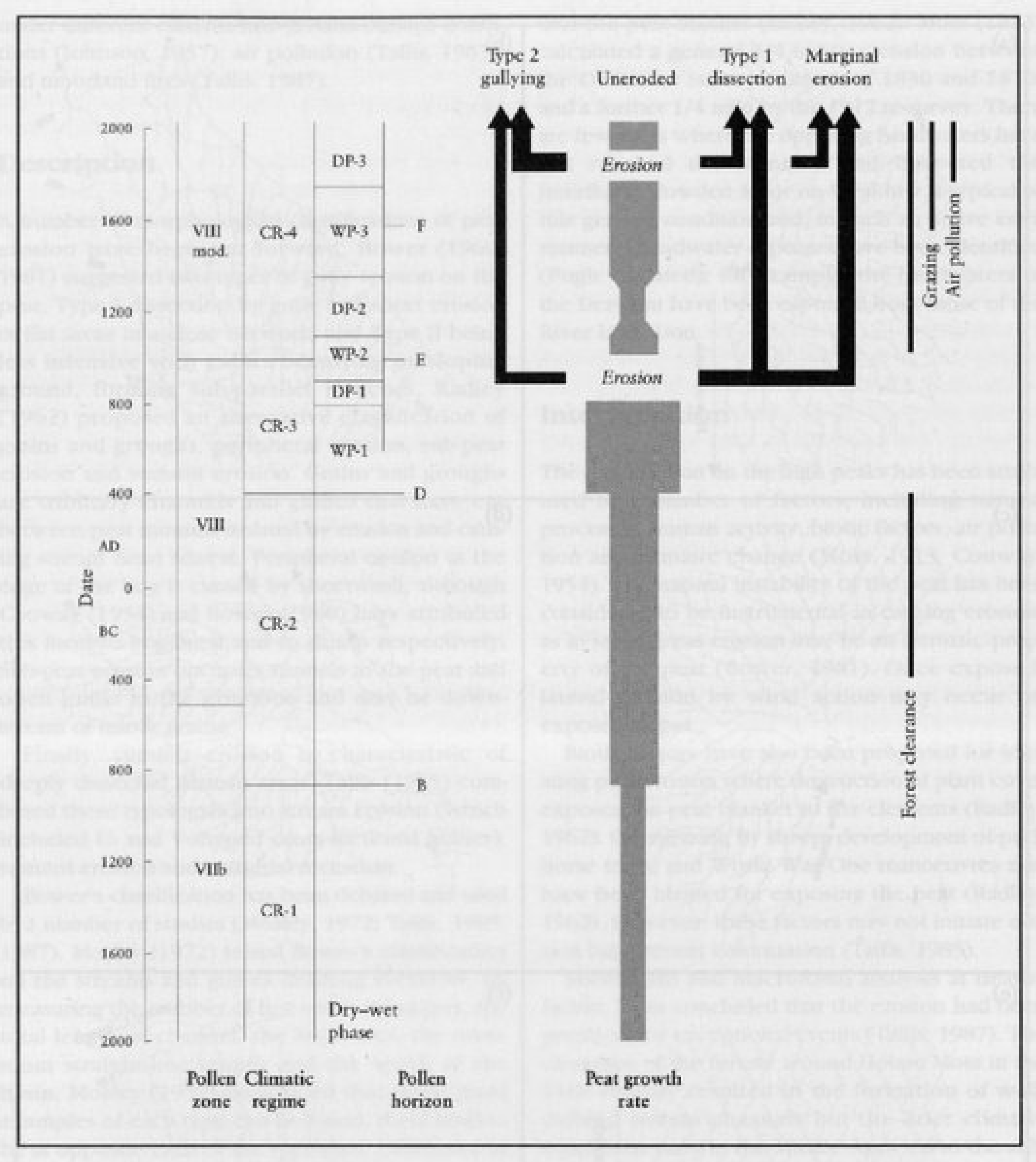
Peat erosion in the Pennines has occurred in phases over the past 4000 years to produce a range of different erosional features (Bower, 1960, 1961; Radley, 1962; Tallis, 1965). The causes of erosion are complex, and relate to climate and to human and biotic activity. Exceptional events of both types can initiate erosion, with the important control being the level of vegetation coverage of the peat as, once this has been removed, erosion is more likely to occur. Future changes in climate may have important implications for the heathlands and moors of the Pennines that are currently undergoing erosion. Bleaklow exhibits a range of features of peat erosion and has been the site of investigation into the timing, mechanisms and causes of erosion.

[References](#)

(Figure 6.31) Moorland areas undergoing peat erosion; Laund Clough, Bleaklow GCR site. (Photo: R.J. Davis.)



(Figure 6.32) Simulated and actual streams on Bleaklow: (a,b) convex slopes; (c,d) concave slopes; (e,f) straight slopes. (After Mosley, 1972.)



(Figure 6.33) Chart showing Featherbed Moss peat changes over time. (After Tallis, 1985.)