The Manger

[SU 298 868]

Highlights

Incised into the escarpment of the Berkshire Downs, the Manger is one of the finest chalk dry valleys, or combes, in Britain. It is especially notable for the series of steep chutes which serrate its southern flank and for its well documented floor sediments and downslope alluvial fan.

Introduction

The Manger is one of many short dry valleys which etch the chalk escarpments of southern England. It is incised into the northern escarpment of the Berkshire Downs, overlooking the Vale of the White Horse (Figure 7.1). The Manger's importance lies in the sediments which mantle the floor of the valley and fan out into the Vale. These provide evidence for the geomorphic evolution of the valley, which is pertinent to the many other similar dry valleys in England's chalk downland. The debate over the origins of the chalk dry valleys has extended through many years (Smith, 1975b). The two main suppositions are that the valleys were cut by normal stream action which has since gone underground (Chandler, 1909; Fagg, 1923, 1954; Sparks and Lewis, 1957; Small, 1962, 1964), or that they were cut by runoff and solifluction processes under periglacial conditions (Reid, 1887, 1892; Bull, 1936, 1940; Kerney *et al.,* 1964; Sheail, 1971). The geomorphology of the Manger has been described by Arkell (1947), Beckinsale (1954), Paterson (1977) and Goudie and Gardner (1985).

Description

Overlooking the broad Vale of the White Horse, the chalk escarpment rises steeply for 100 m, and is scored by many short, steep, dry valleys. The Vale is developed largely on the Mesozoic Gault and Kimmeridge clays, which are separated from the chalk by a narrow band of Greensand cropping out at the foot of the scarp. The Lower and Middle Chalks form the bulk of the escarpment, with some of the Upper Chalk surviving along the crest; they dip 1–3° south.

The Manger combe is a rounded valley about 500 m long and 50 m deep, cut into the scarp-face below Whitehorse Hill (Figure 7.6). It is totally dry. Its floor gradient is up to 36° near the head of the combe, but this eases to less than 10° lower down. The long profile is a smooth graded slope, convex over the upper rim and concave on the lower slopes; the cross-valley profiles are generally symmetrical. On the southern slope of the combe, the left bank is corrugated by a series of ten much smaller combes or furrows (Figure 7.7). These are each about 120 m long and 40 m across, and are incised by about 5 m.

Both the geomorphology of the valley and the stratigraphy of the combe floor alluvium and fan deposits were investigated by Paterson (1977), using electrical resistivity surveys, field mapping, excavated trenches and over 800 augered bore-holes. The floor of the valley is cut in the chalk until it breaks through to the underlying sandstone (Figure 7.8). Bedrock is covered by up to 5 m of white, angular, chalk rubble and silt; above this are up to 3 m of grey-brown, humic, chalk silts with occasional chalk and flint fragments, capped by a thin layer of topsoil (Paterson, 1977). These deposits can be traced the whole length of the combe, and the white chalk rubble alone extends into the gently graded fan of chalk detri tus which reaches out over 2 km from the foot of the scarp face (Figure 7.6). A terrestrial molluscan fauna is preserved in a cryoturbated chalk debris in the equivalent fan below the combe to the west of the Manger (Paterson, 1971, 1976).

Interpretation

The origin of the Manger was ascribed to spring sapping when the water table was higher (Arkell, 1947), and the gullies on the south side were interpreted as old spring sites which represent former positions of the spring line. This concept is, however, incompatible with the large amount of sediment remaining within the Manger. Excavation by surface run-off and solifluction is indicated by depositional evidence from the banded gravels in the combe floor (Paterson, 1977). The Manger was carved out by an abundance of meltwater from annual snow banks on the summit of the escarpment. This was aided by seasonal solifluction on the valley sides, which led to major deposition on the valley floor, but the importance of meltwater transport is demonstrated by the large fans of well sorted chalk debris extending out onto the clay floor of the Vale.

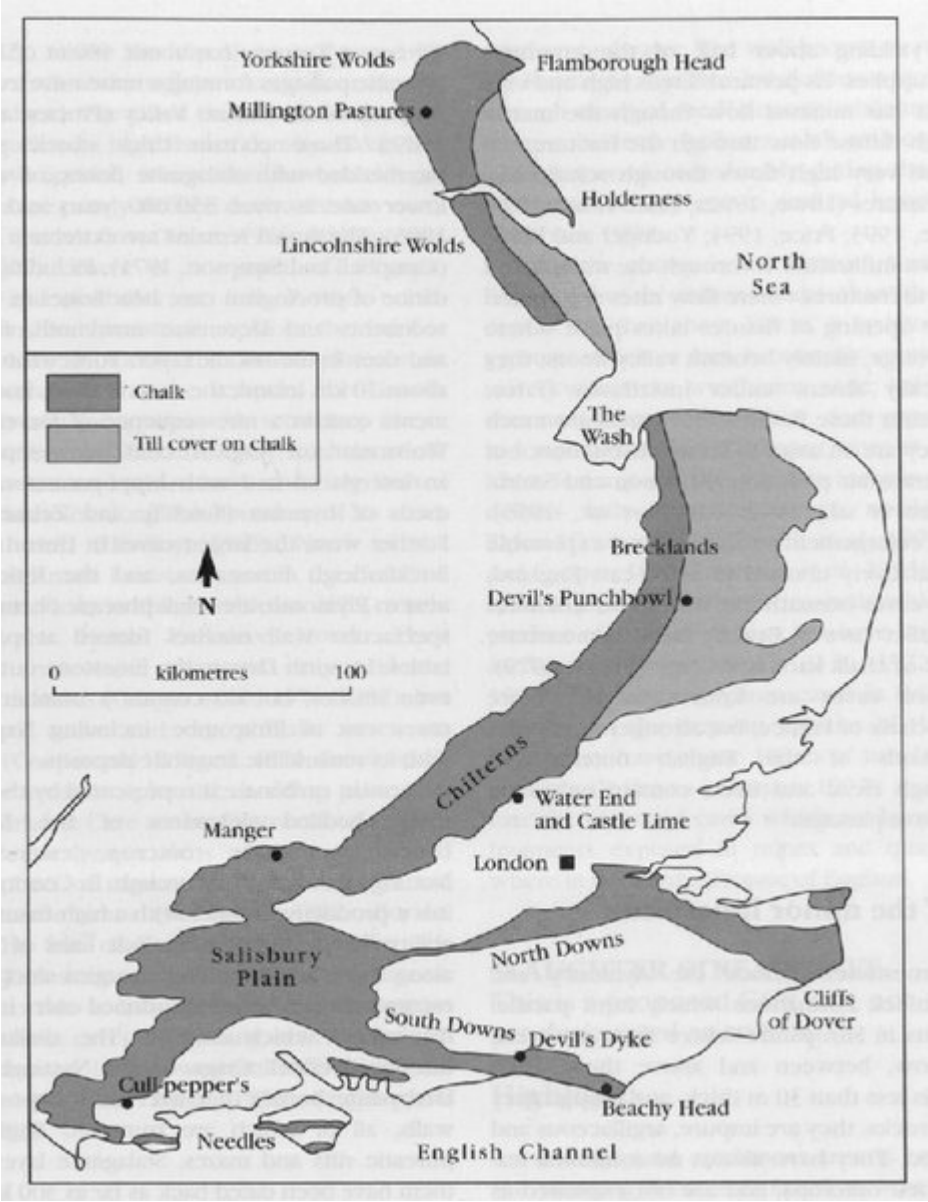
The dry furrows, or small-scale combes, in the south slope of the main dry valley have been attributed by Paterson (1977) to the sites of former springs, which supplied water into the valley and provided the loci for intensive freeze-thaw action and other periglacial processes. Alternatively, they may be avalanche tracks (Goudie and Gardner, 1985), dating from Devensian periglacial environments. Avalanches can cause erosion of a weak bedrock such as frost-shattered chalk. The north-east aspect of the slope makes it a prime site for snowdrift accumulation in winds from the south-west; spring avalanches would scour the thawing, weakened, active layer within the chalk, and would repeatedly follow the same tracks.

The volume of sediments in the alluvial fan represents about a quarter of the volume of the Manger valley. This implies that much of the material eroded is still present in the fans, and suggests a relatively recent origin for the deposits. The stratigraphy of the deposits, the nature of their molluscan faunas, the absence of deep leaching and chemical weathering, and their geomorphic relationship to the surrounding land, all indicate a Devensian age. Paterson (1976) assigned the molluscan assemblage to the Allerød Interstadial of the Late Devensian. He then dated the soliflucted chalky debris to the succeeding cold environment of the Loch Lomond Stadial (10.8–10.3 ka), and the brown chalk silts to hillwash following clearance and cultivation in the Holocene. Though there is no surviving evidence of pre-Devensian sediments, the scale of the Manger, compared to the volume of sediments, demonstrates that the valley was incised over several cold phases during the Pleistocene. In each of the intervening warmer stages, and in the Holocene, renewed underground drainage led to the combe becoming a temporarily inactive dry valley.

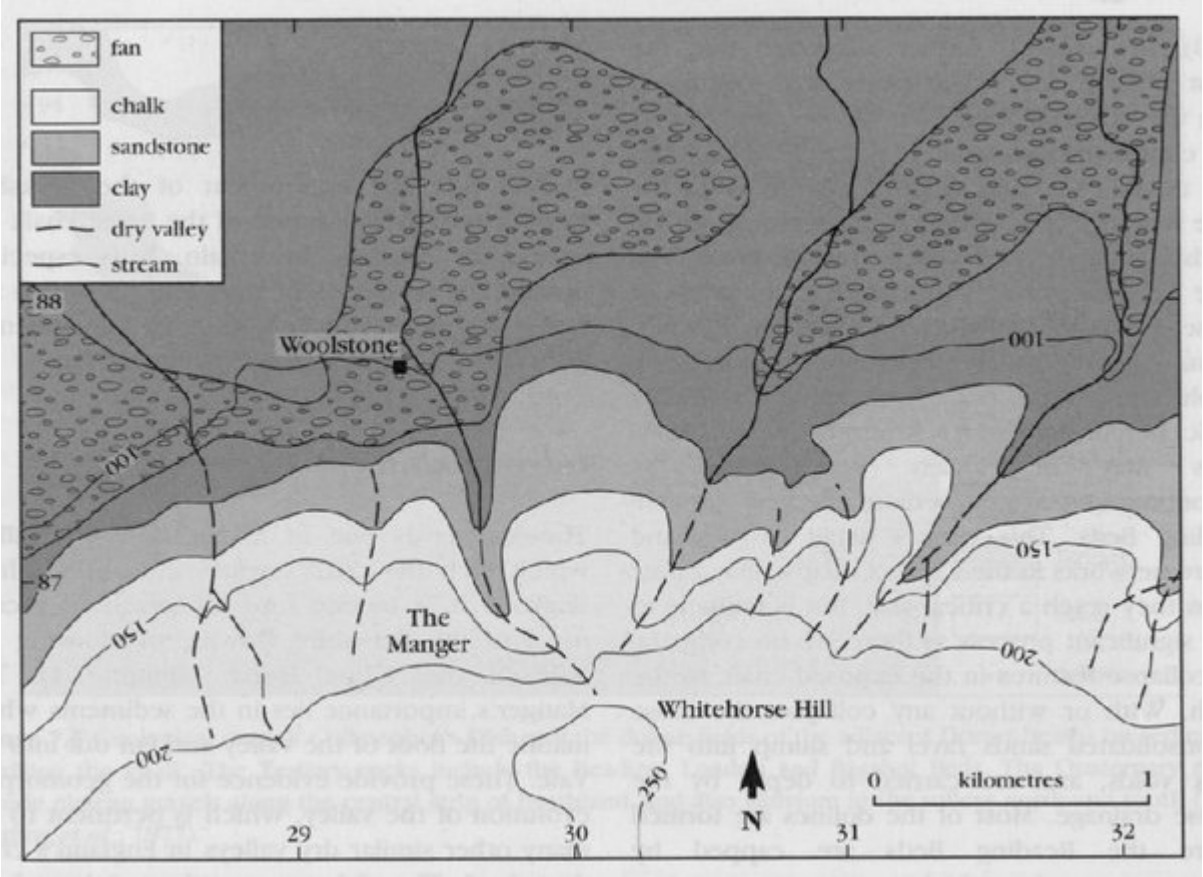
Conclusions

The Manger is a spectacular combe incised into the scarp face of the Berkshire Downs; it is a particularly fine example of this type of dry valley which is distinctive of England's chalk karst. The sediments preserved in the valley floor and in a fan extending out in the Vale to the north provide striking evidence of solifluction and periglacial excavation during the Devensian glaciation. The furrows preserved on the southern side may represent either an abandoned spring line or relict avalanche tracks. The dry combe is excellent evidence of the karstic preservation of a periglacial landform.

References

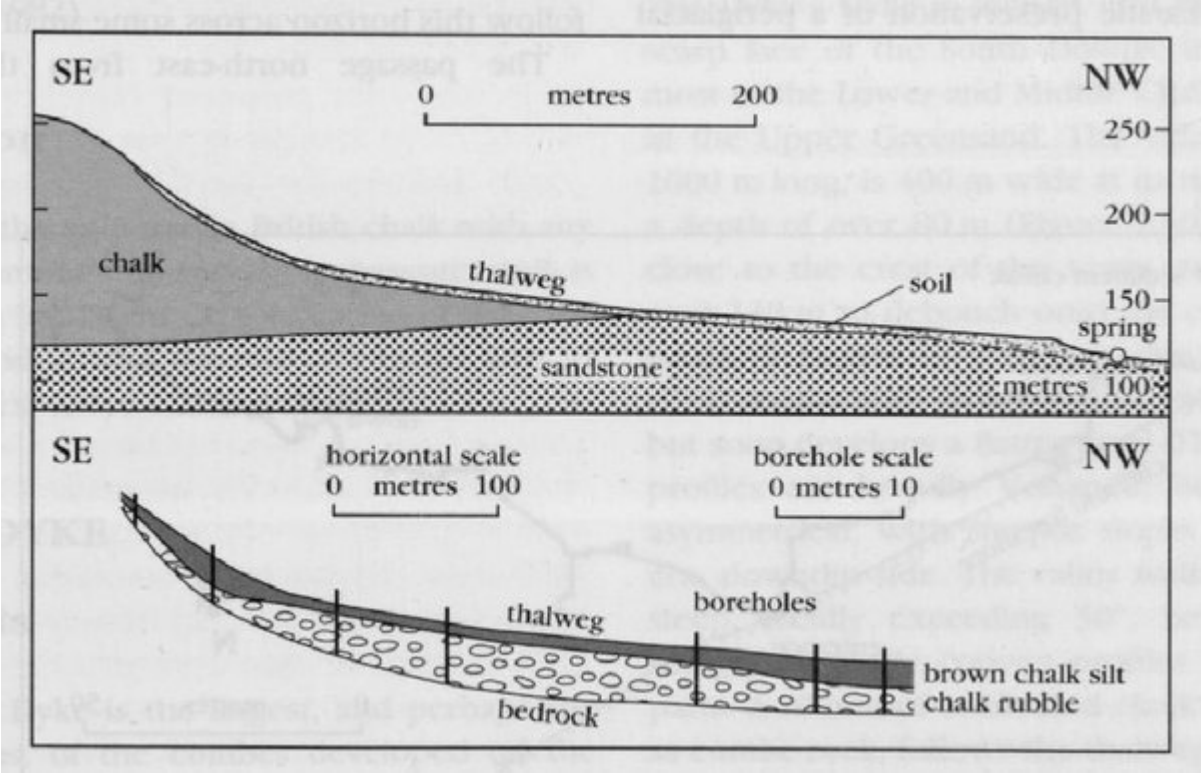


(Figure 7.1) Outline map of the chalk karst of England, with locations documented in the text. Superficial deposits occur on many parts of the Chalk outcrop; only the large areas of glacial till are distinguished on this map, as they mask most topographic expression of the karst.



(Figure 7.6) Geological map of the Berkshire Downs scarp face, with its dry valleys, or combes, including the Manger, and associated fan deposits.

(Figure 7.7) The dry valley of the Manger seen from its head; the chalk of its south slope is scored by the series of furrows or small-scale combes, above the flatter valley floor veneered by solifluction debris. (Photo: A.C. Waltham.)



(Figure 7.8) Long profiles of the floor deposits in the Manger. The upper profile is drawn to true horizontal and vertical scales. In the lower profile the soil thicknesses are increased by a factor of 8 (after Paterson, 1977).