Figures and tables

Figures

the same karst unit. Higher limestones within the Yoredale Series are not marked. Basement rocks are Palaeozoic slates and greywackes. Cover rocks are the Yoredale facies of the middle and late Brigantian Wensleydale Formation and various Upper Carboniferous and Permian clastic formations.

(Figure 2.2) Outline map of the Ease Gill Cave System. Limestone is the Great Scar Limestone. Basement rocks are Silurian clastics only exposed west of the Dent Fault. Cover rocks are Yoredale and Namurian shales and sandstones. Notts Pot drains into the lower reaches of Gavel Pot (see Figure 2.5) (from surveys by Red Rose and Happy Wanderers Caving and Potholing Clubs, Northern Pennine Club, Cave Diving Group and many others.)

(Figure 2.3) Straw stalactites and short stalagmites form a spectacular display in Easter Grotto, part of the high-level passages in Ease Gill Caverns. (Photo: A.C. Waltham.)

(Figure 2.4) A few horizontal bedding planes score the cleanly washed walls of the waterfall shaft at Wet Pitch in Lost Johns Cave. (Photo: A.C. Waltham.)

(Figure 2.5) Outline map of the cave systems under the southern flank of Gragareth. Ireby Cavern and Notts Pot drain north into the Ease Gill Cave System, joining the water from the Leck Fell Master Cave, where the high-level passages in Lost Johns and Short Drop Caves have been omitted for clarity (see Figure 2.2); Marble Steps and Large Pot drain east to Keld Head (see Figure 2.8) (from surveys by Northern Pennine Club, Northern Cave Club and others).

(Figure 2.6) Map of the Entrance Series of Lost Johns Cave showing contrasts in passage morphology on shale horizons and joints, as described in the text (from surveys by London University Caving Clubs and University of Leeds Speleological Association).

(Figure 2.7) Profile through the main caves under the southern part of Leek Fell, with many passages omitted to improve clarity. The two palaeowater tables are recognized from the cave morphology, and are ascribed minimum ages based on dated cave sediments, as described in the text. The horizontal scale is approximately the same as the vertical scale, but is distorted by changes in the direction of projection. (After Waltham and Hatherley, 1983; Waltham, 1986.)

(Figure 2.8) Outline map of the caves of Kingsdale. These include 7.5 km of caves behind Keld Head, at the southern end of the system and beneath the valley floor, which are totally flooded (from surveys by University of Leeds Speleological Association, Cave Diving Group and others).

(Figure 2.9) The vadose trench cut in the floor of the broad phreatic tunnel in the West Kingsdale Master Cave. (Photo: A.C. Waltham.)

(Figure 2.10) Swinsto Hole to Keld Head, the type example of a Yorkshire Dales cave, and part of the Kingsdale cave system. Only the main passages along the underground drainage route are shown; there are additional vadose inlets, abandoned passages and phreatic loops. The vertical scale of the long section is exaggerated by a factor of 1.5. (Mainly after Waltham *et al.,* 1981.)

(Figure 2.11) Geological map of Scales Moor. The limestone is the Great Scar Limestone, including the Hawes Limestone. Cover rocks are mainly clastic units in the Wensleydale Group. Basement rocks are Palaeozoic slates and greywackes. Only the larger areas of pavement are marked, and there are thin strips of pavement along the crest of nearly all the scars. Dale Barn Cave lies close to the base of the limestone, about 150 m below the main limestone pavements (cave survey from Northern Cave Club).

(Figure 2.12) The wide expanse of massive limestone pavement on Scales Moor, broken only by the deep rundkarren runnels and erratic blocks of sandstone and limestone. (Photo: A.C. Waltham.)

(Figure 2.13) Geological map of Ingleborough, with the main areas of limestone pavement, the larger dry valleys and some of the main underground drainage routes. The limestone is the Great Scar Limestone, including the Hawes Limestone. Cover rocks are various clastic units and thin limestones in the Wensleydale Group and the Namurian Millstone Grit Group, and Upper Carboniferous clastics south of the Craven Faults. Basement rocks are Palaeozoic

slates and greywackes. The only pavements marked are those of good or excellent quality (as defined by Waltham and Tillotson, 1989).

(Figure 2.14) Geomorphological map of the southern sector of Ingleborough. The main pavements in the eastern half of the map area were scoured by ice moving down Ribblesdale, while the limestone in the western half is extensively veneered by glacial till deposited in the lee of the Ingleborough summit mass (from Waltham, 1990).

(Figure 2.15) Topographic map and projected long profiles of Trow Gill and the underlying caves. Some cave passages have been omitted to improve clarity, and all the caves lie below the level reached on the serial cross-sections; the thalweg down Trow Gill lies along the centreline of the path (from Waltham, 1990).

(Figure 2.16) The limestone pavements of Southerscales Scars, on the north-western bench of Ingleborough. (Photo: A.C. Waltham.)

(Figure 2.17) Glacial erratic of Silurian greywacke on the Norber bench of southern Ingleborough. The erratic is 2 m across and stands on a plinth of limestone which has been protected from solution by direct rainfall. (Photo: A.C. Waltham.)

(Figure 2.18) Outline map of Ingleborough, with locations of the main caves referred to in the text. Geology as in Figure 2.13.

(Figure 2.19) Outline map of White Scar Cave (from survey by Happy Wanderers Cave and Pothole Club).

(Figure 2.20) Long calcite straw stalactites in the Far Streamway of White Scar Cave. (Photo: A.C. Waltham.)

(Figure 2.21) Outline map of the cave systems of Meregill Hole; the flooded passage downstream of Roaring Hole is known to continue for another 300 m. Numbers given refer to elevation in metres (from surveys by University of Leeds Speleological Association).

(Figure 2.22) Outline map of the mainly flooded cave passages beneath Chapel Beck (from surveys by Cave Diving Group).

(Figure 2.23) Outline map of the Alum Pot cave system; the Alum Pot sump is known to continue for another 220 m beyond the margin of this map (from survey by University of Leeds Speleological Association).

(Figure 2.24) Sharply scalloped limestone forms the walls of the vadose canyon cut beneath the bedding plane roof in the streamway of Upper Long Churn Cave. (Photo: A.C. Waltham.)

(Figure 2.25) The Main Chamber of Gaping Gill, with the 110 m waterfall lit by daylight from the pothole which swallows Fell Beck. (Photo: A.C. Waltham.)

(Figure 2.26) Outline map of the Gaping Gill Cave System, including the passages of Ingleborough Cave and Car Pot. Figures given represent elevation in metres. (From surveys by Bradford Pothole Club and many others.)

(Figure 2.27) Outline map of the caves of Red Moss and Birkwith, draining the limestone bench beneath part of the Ribblesdale drumlin field. Figures given represent elevation in metres (from surveys by Burnley Caving Club and others).

(Figure 2.28) Outline map of the cave systems within the Brants Gill catchment. The limestone includes the Great Scar, Hawes and Gayle Limestones. Cover rocks are the shales and higher limestones of the Wensleydale Group. Basement rocks are Palaeozoic slates and greywackes. Only the main cave passages are marked. Flow from all the main sinks is to Brants Gill Head, except when floodwaters emerge from Douk Gill Head (from surveys by University of Leeds Speleological Association, Northern Pennine Club and Cave Diving Group).

(Figure 2.29) Outline map of the cave passages in Penyghent Pot; the Spike Pot entrance passage is only sketched in (from survey by University of Leeds Speleological Association).

(Figure 2.30) Hunt Pot with a small stream tumbling 27 m down a vertical, solutionally enlarged fissure. (Photo: A.C. Waltham.)

(Figure 2.31) Outline map of the main caves of Fountains Fell; the drainage links into the Fountains Fell Master Cave are not proven (from surveys by University of Leeds Speleological Association, Northern Pennine Club and Cave Diving Group).

(Figure 2.32) Fool's Paradise in Gingling Hole — a beautifully decorated phreatic tube and entrenched vadose canyon. (Photo: J.C. Cunningham.)

(Figure 2.33) Geological map of the area around Malham Cove and Gordale Scar. The limestone at Aire Head is a thin basinal facies, distinct from the reef and shelf limestones north of Malham village. Cover rocks are Bowland Shales. Basement rocks are Silurian siltstones. There are many minor faults, mostly orientated NW–SE between the North and Middle Craven Faults. Only the main areas of well formed limestone pavement are marked.

(Figure 2.34) The vertical limestone cliffs, 70–80 m high, of Malham Cove. (Photo: A.C. Waltham.)

(Figure 2.35) The limestone cliffs of Gordale Scar. The tufa waterfalls are lost in the shadows in the meltwater gorge which opens into the glacially excavated amphitheatre. (Photo: A.C. Waltham.)

(Figure 2.36) Long profiles through Malham Cove and Gordale Scar showing the prominent thalweg steps which have retreated from the Middle Craven Fault scarp.

(Figure 2.37) Watlowes, the dry valley excavated by meltwater which leads down to the top of Malham Cove. (Photo: A.C. Waltham.)

(Figure 2.38) Outline geomorphological map of the polygonal karst developed on the limestone crests around High Mark.

(Figure 2.39) The large closed depression between High Mark and Parson's Pulpit. (Photo: A.C. Waltham.)

(Figure 2.40) Geomorphological map of the collapse area and associated caves at Giant's Grave at the head of Penyghent Gill.

(Figure 2.41) The foundered blocks of limestone in the collapse area at Giant's Grave, Penyghent Gill. (Photo: A.C. Waltham.)

(Figure 2.42) Outline map and profile of Sleets Gill Cave and its associated karstic features (from surveys by University of Leeds Speleological Association and others).

(Figure 2.43) Outline map of Boreham Cave (from survey by Cave Diving Group).

(Figure 2.44) Delicate straw stalactites hang down into standing water in the old phreatic tube of the China Shop in Boreham Cave. (Photo: T.G. Yeadon.)

(Figure 2.45) Long section through Strans Gill Pot (from survey by British Speleological Association).

(Figure 2.46) Outline map of the Birks Fell and Birks Wood Caves (from surveys by Craven Pothole Club and Cambridge University Caving Club).

(Figure 2.47) The tall, narrow rift of Dowber Gill Passage in Dow Cave (Photo: M.H. Long.)

(Figure 2.48) Outline map of Mossdale Caverns and Langcliffe Pot, which both drain to Black Keld. The limestone includes the Great Scar Limestone and the Yoredale facies limestones of the overlying Brigantian Wensleydale Group; the latter are separated by thin shales and sandstones that are not marked (from surveys by University of Leeds Speleological Association and others).

(Figure 2.49) Outline map of the dry valleys, scars and limestone pavements of Conistone Old Pasture. Cover rocks are the shales and limestones of the Yoredale facies, above the Great Scar Limestone.

(Figure 2.50) The dry valley of Conistone Dib, seen from the limestone scars with Wharfedale in the distance. (Photo: A.C. Waltham.)

(Figure 3.1) Outline map of the karst regions in the northern Pennines, with locations referred to in the text. The other Carboniferous rocks are the non-carbonates of the Orton Group and Yoredale facies of the Dinantian, and the Namurian, but they include thin bands of limestone with lesser karst features not shown on this map. The Carboniferous limestone includes the Dinantian Great Scar Limestone, the Yoredale limestones with significant karst, and the Main or Great Limestone of Namurian age. The basement rocks are Lower Palaeozoic non-carbonates. Details and locations in the southern Dales are shown in (Figure 2.1).

(Figure 3.2) Outline map of the limestone hills of Farleton Knott and Hutton Roof Crags. Basement rocks are Silurian mudstones. Cover rocks are the Brigantian and Namurian Bowland Series. The drift margin marks the edge of the thicker glacial till which covers most of the lowland around the limestone hills (partly after Moseley, 1972).,

(Figure 3.3) The distinctive inclined limestone pavements of the Rakes above Hutton Roof, with the deep rinnenkarren raking down the diamond-shaped slabs between the joint-guided kluftkarren. (Photo: A.C. Waltham.)

(Figure 3.4) The excellent pavements with square clints deeply scored by rundkarren on Newbiggin Crags. (Photo: A.C. Waltham.)

(Figure 3.5) Outline map of the limestone pavements on Gait Barrows.

(Figure 3.6) The very large clints in the central open pavements on Gait Barrows. (Photo: A.C. Waltham.)

(Figure 3.7) Outline map of Hale Moss Cave (from survey by Red Rose Cave and Pothole Club).

(Figure 3.8) Outline map of the caves of Upper Dentdale. The line of the flooded section in the upstream sump of Tub Hole is only approximate (from surveys by Kendal Caving Club, British Speleological Association, Cave Diving Group and others).

(Figure 3.9) Tributary passage in Broadfield Cave with calcite deposits in a shallow vadose canyon cut beneath a bedding plane. (Photo: M.H. Long.)

(Figure 3.10) Outline map of the cave passages in Stump Cross Caverns and Mongo Gill Hole (from survey by Craven Pothole Club).

(Figure 3.11) Thick flowstone deposits in a suite dated to 83 000 ka in the Wolverine Cave in Stump Cross Caverns. (Photo: A.C. Waltham.)

(Figure 3.12) Geological map of the caves in the upper part of Nidderdale. Limestone includes the Middle, Five Yard and Three Yard Limestones. Grit cover is the Grassington Grit and some overlying Namurian beds on the higher slopes. Eglin's Cave extends off the map to the west. (Outcrop geology after Wilson, 1983; cave surveys from Yorkshire Underground Research Team, Cave Diving Group and others.)

(Figure 3.13) Profile of the geology and cave passages in the western part of New Goyden Pot. The main streamway flows south towards the Thrope Edge Fault, and then turns into a loop back to the north which is not shown in this profile downstream of the entrance shaft. The grit is the Grassington Grit; the limestone includes the Middle, Five Yard and Three Yard Limestones; the sandstones and shales are of the lower Brigantian and include the Simonstone Limestone at an unknown depth. (After Davies, 1974b.)

(Figure 3.14) Outline map of the limestone bench containing the Hell Gill gorge and various sinkholes, risings and cave on the adjacent streams.

(Figure 3.15) Geological map of Cliff Force Cave and the Buttertubs. Both the Namurian cover and the underlying Dinantian rocks include thin limestones not shown and not connected to the Main Limestone (cave survey from Moldywarps Speleological Group).

(Figure 3.16) The fluted potholes and limestone pinnacles at the Buttertubs. (Photo: A.C. Waltham.)

(Figure 3.17) Outline map of the limestone pavements of the Clouds. The position of the anticline axis is only approximate. Cover rocks are the alternating sequence of shales and thin limestones which follow in the Alston Group.

(Figure 3.18) Crescentic scars in strong beds of limestone folded over the anticline crest on Fell End Clouds. Pleistocene ice moved from right to left, leaving deeply tunnelled pavement in the immediate lee of the scars. (Photo: H.S. Goldie.)

(Figure 3.19) Outline map of the karst features on the limestone escarpment between Great Asby Scar and Potts Valley. The Robinson Limestone includes a thin shale separating it from the Great Scar.

(Figure 3.20) Deep parallel rundkarren on very long clints aligned on the strike of the gently dipping limestone pavements on Great Asby Scar. (Photo: S. Webb.)

(Figure 3.21) Geological map of the pavements on the Helbeck Scars. The Alston Group includes thin limestones with low scars and narrow pavements which are not marked.

(Figure 3.22) The upstream side of the limestone span of God's Bridge across the River Greta. (Photo: A.C. Waltham.)

(Figure 3.23) Outline map of Knock Fell Caverns, without the much shorter lower series which are omitted for clarity (from survey by Gritstone Club).

(Figure 3.24) One of the rift passages in Knock Fell Caverns, where dissolution by the slowly moving phreatic water etched out lithological contrasts in the limestone walls. (Photo: A.C. Waltham.)

(Figure 3.25) Outline map of Fairy Holes and the limestone bench which it drains. The cave and outcrops are shown in their original form, previous to development of the quarry; the limestone has been largely removed from its outcrop southwards to the quarry face, which has also cut into part of the non-carbonate cover. Except for a tiny fragment behind the original resurgence entrance, all the cave passage north of the quarry face has been destroyed (from cave survey by University of Leeds Speleological Association).

(Figure 4.1) Outline map of the Peak District karst, with locations referred to in the text. The cover rocks are Namurian shales and sandstones, and younger stratigraphic units.

(Figure 4.2) Outline map of the Castleton caves, with only the main streamways shown in the Peak and Speedwell caves at the resurgence end of the system. The rakes are mineral veins which carry some of the karst drainage though their fissure systems.

(Figure 4.3) Outline map of the cave passages in Giant's Hole, Oxlow Caverns and Nettle Pot (from surveys by Eldon Pothole Club).

(Figure 4.4) Outline map of the Peak-Speedwell Cave System (from surveys by Technical Speleological Group and Cave Diving Group).

(Figure 4.5) The phreatic tube which forms the main part of the stream cave in Peak Cavern. The inception bedding plane is marked by the wall niches, and this section has no vadose trench yet cut in its floor. (Photo: J.R. Wooldridge.)

(Figure 4.6) The limestone gorge of Winnats Pass, seen from the Hope Valley. (Photo: T.D. Ford.)

(Figure 4.7) Geological map of the Castleton reef belt containing Winnats Pass and Cave Dale.

(Figure 4.8) The lower part of Cave Dale looking downstream. Peveril Castle, on the left, overlooks the head of the adjacent Peak Cavern gorge. (Photo: A.C. Waltham.)

(Figure 4.9) Geological map of Bradwell Dale and Stanlow Dale. Bagshaw Cavern is shown in outline, and lies mainly in the bedded limestones beneath the reef knolls (from survey by Eyam Exploration Group).

(Figure 4.10) Outline map of the cave systems under the northern flank of Stoney Middleton Dale (from survey by Technical Speleological Group).

(Figure 4.11) Long profile through Merlin's Cave and Carlswark Cavern showing the development on four levels (after Christopher and Beck, 1977).

(Figure 4.12) Outline map of Lathkill Dale, its tributary dry valleys and its associated cave systems.

(Figure 4.13) The entrenched and normally dry section of Lathkill Dale just above the Lathkill Head flood resurgence. (Photo: A.C. Waltham.)

(Figure 4.14) Limestone walls and some remnants of the Pliocene sediment fill left after quarrying of the northwestern of the Green Lane Pits. (Photo: T.D. Ford.)

(Figure 4.15) Diagrammatic sections of two stages in the formation of the Brassington Formation and their preservation in the collapse dolines in the limestone (after Ford, 1984).

(Figure 4.16) Geological map of Masson Hill and its cave passages, in relation to the Matlock Bath gorge. The mine workings in solid rock and the re-excavated natural caves are complexly interwoven; the symbols for cave and mine are generalized. The caves within the open pit have all been destroyed.

(Figure 4.17) Ribs of limestone left around solution cavities which were filled and then re-excavated by miners in the Black Ox Mine workings in Great Masson Cavern. (Photo: T.D. Ford.)

(Figure 4.18) Geological map of the active and dry valley systems of Dove Dale and the Manifold River in relation to the reef knolls in the Carboniferous limestone (partly after Ford and Burek, 1976).

(Figure 4.19) The limestone arch of Reynard's Cave, in the side of Dove Dale, looking through to the cave remnant beyond the breached section. (Photo: A.C. Waltham.)

(Figure 5.1) Outline map of the Mendip Hills karst, with locations referred to in the text. Cover rocks are mostly the Triassic and Jurassic mudstones and limestones; Upper Carboniferous rocks form the thrusted outlier on the east side of Ebbor Gorge. The Triassic Dolomitic Conglomerate is included with the Carboniferous limestone where it is composed of blocks of the limestone and is an integral part of the karst. Older rocks are the Devonian Old Red Sandstone and the Dinantian Lower Limestone Shale.

(Figure 5.2) Geological map of Burrington Combe and the infilled Triassic valleys cut into the northern slope of the Mendip Hills (after Williams and Farrant, 1992).

(Figure 5.3) Outline map of GB Cave, Charterhouse Cave and the main surface features above them (from survey by University of Bristol Speleological Society).

(Figure 5.4) Massive banks, terraces and false floors of coarse breakdown, clastics and stalagmite flowstone in the Gorge of GB Cave. (Photo; A.C. Waltham.)

(Figure 5.5) Extended profile of Longwood Swallet (from survey by University of Bristol Speleological Society).

(Figure 5.6) Outline map of Manor Farm Swallet (from survey by University of Bristol Speleological Society).

(Figure 5.7) Phases of stalagmite and gravel deposition in GB Cave, with a chronology based on stalagmite dates obtained from uranium-series, ESR and palaeomagnetic techniques (after Farrant, 1995). Stalagmite ages are represented covering the error bars on the dated samples; actual time spans of the deposition phases may be smaller, but data from stalagmites as yet undated may increase the lengths of the deposition phases.

(Figure 5.8) Map of Cheddar Gorge and the lower part of its dry valley system reaching across the karst to the edge of the Mendip Plateau.

(Figure 5.9) Cheddar Gorge, looking upstream from the northern rim opposite High Rock. The limestone dips to the right, ensuring the stability of the cliffs on the right, while the left slope is cut back almost to the dip of the bedding planes. (Photo: A.C. Waltham.)

(Figure 5.10) Long profile of Cheddar Gorge up into the Longwood Valley, with the caves beneath. Each palaeo-water table is recognized from cave and surface morphology, and is dated from the sediments in associated cave passages at both the swallet and resurgence ends of the system. The water tables steepen greatly in the sandstone and shale, but are marked beyond the limestone only to label the caves in which each is recorded (G = GB Cave; L = Longwood Swallet; M = Manor Farm Swallet; R = Rhino Rift). The horizontal scale is distorted by the projection, and the vertical scale is exaggerated three times (largely after Stanton, 1985; Farrant, 1995).

(Figure 5.11) Outline map of Gough's Cave, Cheddar. Long Hole and Great Oone's Hole lie partly over the show cave section and are omitted for clarity (from surveys by Wessex Cave Club and Cave Diving Group).

(Figure 5.12) Outline map of Swildon's Hole (from survey by Wessex Cave Club).

(Figure 5.13) The cascading streamway in thinly bedded Black Rock Limestone in Swildon's Hole. (Photo: J.R. Wooldridge.)

(Figure 5.14) Outline map of St Cuthbert's Swallet (from survey by Bristol Exploration Club).

(Figure 5.15) Semi-extended profile through the cave system from Swildon's Hole to Wookey Hole. The gap in the middle has not yet been reached by underground explorations; the distance between the explored limits of the two caves is about 2.3 km, and the vertical scale is exaggerated by five. The small caves in the ravine are keyed as: B = Badger Hole; R = Rhinoceros Hole; H = Hyaena Den (after drawings by W.I. Stanton).

(Figure 5.16) Topographic map of the group of closed depressions forming the zone of polygonal karst on the edge of the Mendip Plateau (after Ford and Stanton, 1968).

(Figure 5.17) Cross-section through the depression and sinkhole of Cross Swallet (after Ford and Stanton, 1968).

(Figure 5.18) The Wurt Pit doline breaks the gently graded surface on the Harptree Beds outcrop. (Photo: A.C. Waltham.)

(Figure 5.19) Projected profile through Thrupe Lane Swallet (from survey by Mendip Nature Research Committee).

(Figure 5.20) Outline map of the cave systems revealed where the Fairy Cave Quarry cut into the limestone outcrop (from survey by Cerberus Caving Club).

(Figure 5.21) Pillar Chamber in Shatter Cave. (Photo: A.C. Waltham.)

(Figure 5.22) Outline map of Stoke Lane Slocker (from surveys by Wessex Cave Club and Cave Diving Group).

(Figure 6.1) Outline map of the karst areas around the perimeter of the South Wales coalfield, with locations referred to in the text. The cover rocks in the south are Triassic and Jurassic mudstones and thin limestones.

(Figure 6.2) Outline map of karst features in the Carboniferous Limestone of eastern Clwyd, North Wales, with locations referred to in the text. The main rivers and risings are shown as they were before disturbance by the mine drainage. The

basement is Ordovician shale; the cover rocks are Upper Carboniferous and Triassic clastics. Many of the steps on the boundaries are due to minor faults.

(Figure 6.3) Geological map of the North Crop of the Carboniferous Limestone where it is crossed by the River Tawe in the Swansea Valley. Many small faults are omitted to improve clarity. The sandstones and shales below the limestone are mainly Devonian but include the Lower Limestone Shale from the Carboniferous. The only caves marked are the main stream passages in Dan-yr-Ogof and Ogof Ffynnon Ddu.

(Figure 6.4) Outline map of Dan-yr-Ogof and Cathedral Cave (from survey by South Wales Caving Club).

(Figure 6.5) Passage cross-sections in Dan-yr-Ogof: (a) fault-guided rifts in the Great North Road; (b) collapse-modified tunnels in the Far North; (c) deep vadose canyons in Tunnel Cave and DYO2; (d) phreatic tubes in the synclinal zone of DYO2; (e) phreatic tubes with large vadose floor trenches in DYO1 and DYO2. (After Coase, 1967, and Coase and Judson, 1977.)

(Figure 6.6) Calcite straw stalactites hang from the arched phreatic roof of Cloud Camber in Dan-yr-Ogof. (Photo: J.R. Wooldridge.)

(Figure 6.7) Outline map of Ogof Ffynnon Ddu (from loop beneath the Rawl Series, until it emerges in survey by South Wales Caving Club).

(Figure 6.8) The deep vadose canyon where the Traverses in OFD3 are high in the roof above the upper end of the streamway in Ogof Ffynnon Ddu. The ledges are created by lithological contrasts in the limestone beds. (Photo: J.R. Wooldridge.)

(Figure 6.9) The Columns in Ogof Ffynnon Ddu — calcite stalactites and stalagmites which have grown to connection in a fossil phreatic tube. (Photo: South Wales Caving Club.)

(Figure 6.10) Outline map of the Little Neath River Cave, its surface geology and the adjacent caves of Pwll y Rhyd (from survey by University of Bristol Speleological Society).

(Figure 6.11) Outline map of Porth-yr-Ogof (from surveys by University of Bristol Speleological Society and Cave Diving Group). The dry valley between the sink and resurgence lies almost directly over the largest cave passages.

(Figure 6.12) The main entrance to Porth-yr-Ogof with the River Mellte flowing in between rock terraces determined by the limestone bedding. (Photo: A.C. Waltham.)

(Figure 6.13) Geological map of the doline field on Mynydd Llangynidr (partly after Thomas, 1974: Ogof Carno from survey by Brynmawr Caving Club). The cover rocks are Namurian shales above the Basal Grit and Coal Measures. The sandstone beneath the limestone is Devonian. Much of the limestone outcrop is covered by soliflucted Grit blocks.

(Figure 6.14) Diagrammatic cross-section through the three types of surface depression formed in the Basal Grit due to solution of the limestone beneath (after Thomas, 1974).

(Figure 6.15) Outline map of the caves under Mynydd Llangattwg (from surveys by Chelsea Speleological Society, British Speleological Association, Cwmbran Caving Club, Cave Diving Group and others).

(Figure 6.16) The Time Machine in Ogof Daren Cilau, the largest cave passage in Britain. (Photo: C.D. Westlake.)

(Figure 6.17) Block diagrams showing stages in the evolution of the Llangattwg caves. (A) In the early stage, the Usk headwaters drain into the cave: 1 = vadose flow downdip; 2 = phreatic lift taking water from the base to near the top of the oolites; 3 = phreatic strike flow; 4 = vadose flow on joints; 5 = phreatic conduit looping along joints. (B) In the later stage, the limestone escarpment is perched above the Usk trench: 6 = main drainage on joints with greater downdip component; 7 = older passages invaded by vadose streams; 8 = vadose inlets from limestone outcrop and from glacier melt during Pleistocene; 9 = limited phreatic development behind resurgence. (After Smart and Gardener, 1989.)

(Figure 6.18) Outline map of Ogof Draenen; this is only a centreline plot of the cave, with no indication of passage widths (from survey by Chelsea Speleological Society).

(Figure 6.19) The abandoned conduit of Megadrive in Ogof Draenen, with preserved solutional notches along the wall on the left. (Photo: C.D. Westlake.)

(Figure 6.20) Outline map of Otter Hole (from survey by Birmingham University Speleological Society).

(Figure 6.21) The massive stalagmites and stalactites in the Hall of the Thirty in Otter Hole. (Photo: J.R. Wooldridge.)

(Figure 6.22) Geological map of the area around Pant-y-llyn.

(Figure 6.23) Geological map of the dry valleys and caves of Llethrid. The position of the downstream section in Tooth Cave is only approximate, as it is normally flooded and has not been mapped in detail.

(Figure 6.24) Outline map of the caves of Minera (from surveys by North Wales Caving Club). The Ffynnon Wen resurgence is no longer active as its water has been captured by the deep mine adits.

(Figure 6.25) The Master Passage of the Minera caves where it leaves the Park Vein just north of the Great Cavern. This phreatic tube was beneath the water table until it was drained by the mine adits. (Photo: P.J. Appleton.)

(Figure 6.26) Plan and profile of the caves beneath the River Alyn (from surveys by North Wales Caving Club). The surface river loses water at the various sinkholes along its course on the limestone. Only Ogof Hesp Alyn is shown on the profile; it was almost completely flooded until deep mine adits captured its water.

(Figure 6.27) Looking up the 15 m shaft in Ogof Hesp Alyn. This phreatic lift on a major joint was active and completely submerged until mine drainage lowered the water table in 1901. (Photo: P.J.Appleton.)

(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 7.2) Outline map of the caves in the catchment of the Slaughter Rising. The cover rocks are the Drybrook Sandstone and the Upper Coal Measures. All the sinks marked on the map have been dye traced to the Slaughter Rising (from survey by Royal Forest of Dean Caving Club).

(Figure 7.3) Outline map of the caves of Buckfastleigh (from surveys by Devon Speleological Society).

(Figure 7.4) Clusters of delicate aragonite needles on the walls of a rift in Napps Cave. (Photo: F. Vowler.)

(Figure 7.5) Geological map of Cull-pepper's Dish and the doline fields of the adjacent Dorset heaths on sediments overlying the chalk. The Tertiary rocks include the Reading, London and Bagshot Beds. The Quaternary rocks include plateau gravels along the central strip of heathland, and also alluvium in the valleys north and south (after Sperling *et al.,* 1977).

(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).

(Figure 7.9) Outline map of Beachy Head Cave (from survey by Chelsea Speleological Society).

(Figure 7.10) Topographic map of the Devil's Dyke and the Saddlescombe dry valleys on the South Downs.

(Figure 7.11) Geological map of the Mimmshall Valley with the Water End sinkholes and the Castle Lime Works Quarry.

(Figure 7.12) A section of the preserved face in the Castle Lime Works Quarry exposing the extremely irregular upper surface of the chalk, broken by clay-filled pipes and broader depressions. (Photo: A.C. Waltham.)

(Figure 7.13) The Devil's Punchbowl doline with a lake on its floor in April 1982. (Photo: A.C. Waltham.)

(Figure 7.14) Outline map of the dry valley systems of Millington Pastures and its neighbours in the Yorkshire Wolds chalk escarpment. The chalk outcrop includes those of the impure, red Ferriby and Hunstanton Chalks, forming the lowest 25 m. Only the larger springs are marked.

(Figure 7.15) One of the main dry valleys in the Millington Pastures system, with an almost flat floor of soliflucted head beneath slopes cut in weathered chalk. (Photo: A.C. Waltham.)

(Figure 7.16) Outline map of Moston Flash and the adjacent linear and areal subsidences formed over the Wylkesley Halite. There is no solid outcrop as the entire area is covered by about 20 m of glacial till and glaciofluvial gravels. All the brine wells have now ceased pumping (after Oates, 1981, and Waltham, 1989).

(Figure 7.17) The linear subsidence of Moston Flash, looking south where the left face is steeper because it is retreating in the direction of dip as the depression enlarges. (Photo: A.C. Waltham.)

(Figure 7.18) Diagrammatic section through the breccia of solutional residue at the rockhead in salt karst, with a brine stream flowing beneath an active linear subsidence like Moston Long Flash (from Waltham, 1989).

(Figure 7.19) Solid geology map of the area around Rostherne Mere and the other adjacent subsidence depressions over the Northwich Halite, buried by a complete cover of glacial and glaciofluvial drift.

(Figure 8.1) The limestone crags of Creag nan Uamh containing the Bone Caves, south of the Allt nan Uamh, seen from Beinn nan Cnaimhseag, with the Claonaite valley on the left. (Photo: TJ. Lawson.)

(Figure 8.2) Geological map of the main karst belt in Assynt, containing the caves of the Traligill and Allt nan Uamh Valleys. The dolomites belong to the Durness Group and are underlain by the Lower Palaeozoic quartzites. The cover rocks are klippe of Cambrian quartzite and Eocambrian sandstone lying over major thrust planes.

(Figure 8.3) The Traligill River entrenched on the steeply inclined Traligill Thrust, upstream of Traligill Cave. (Photo: T.J. Lawson.)

(Figure 8.4) Outline map of the cave system of Cnoc nan Uamh (from survey by Grampian Speleological Group).

(Figure 8.5) The Waterslide in Cnoc nan Uamh. (Photo: A.C. Waltham.)

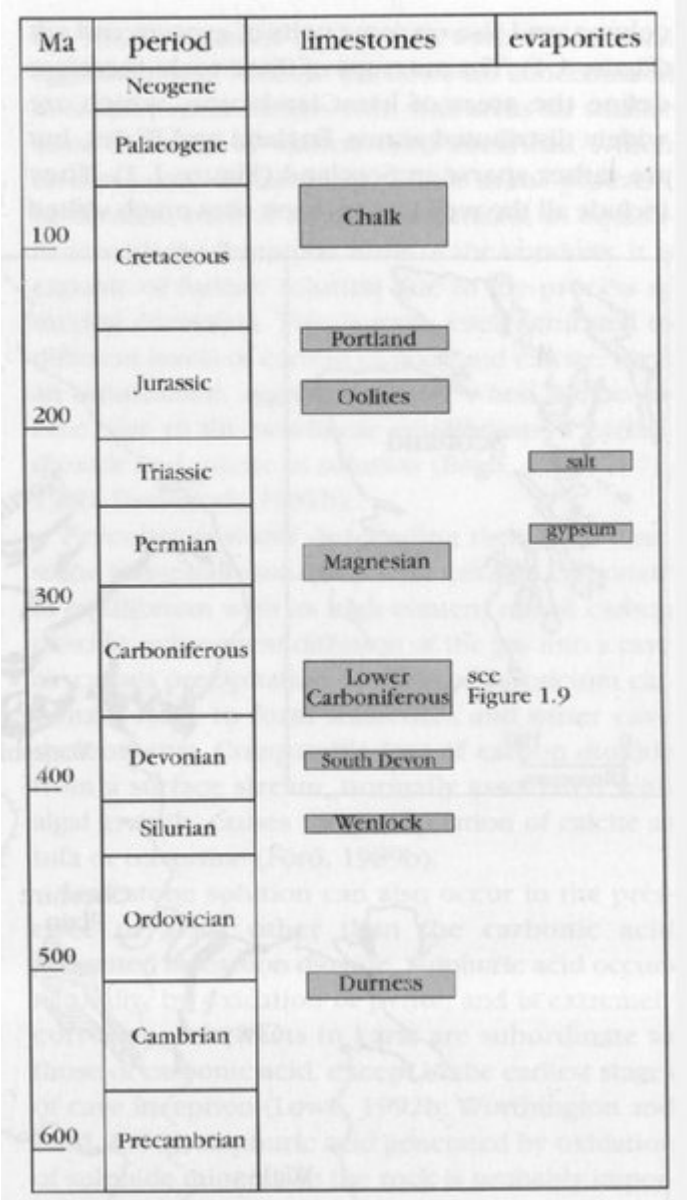
(Figure 8.6) Outline map of Uamh an Claonaite; the survey beyond sump 6 is only a preliminary drawing (from surveys by Grampian Speleological Group).

Tables

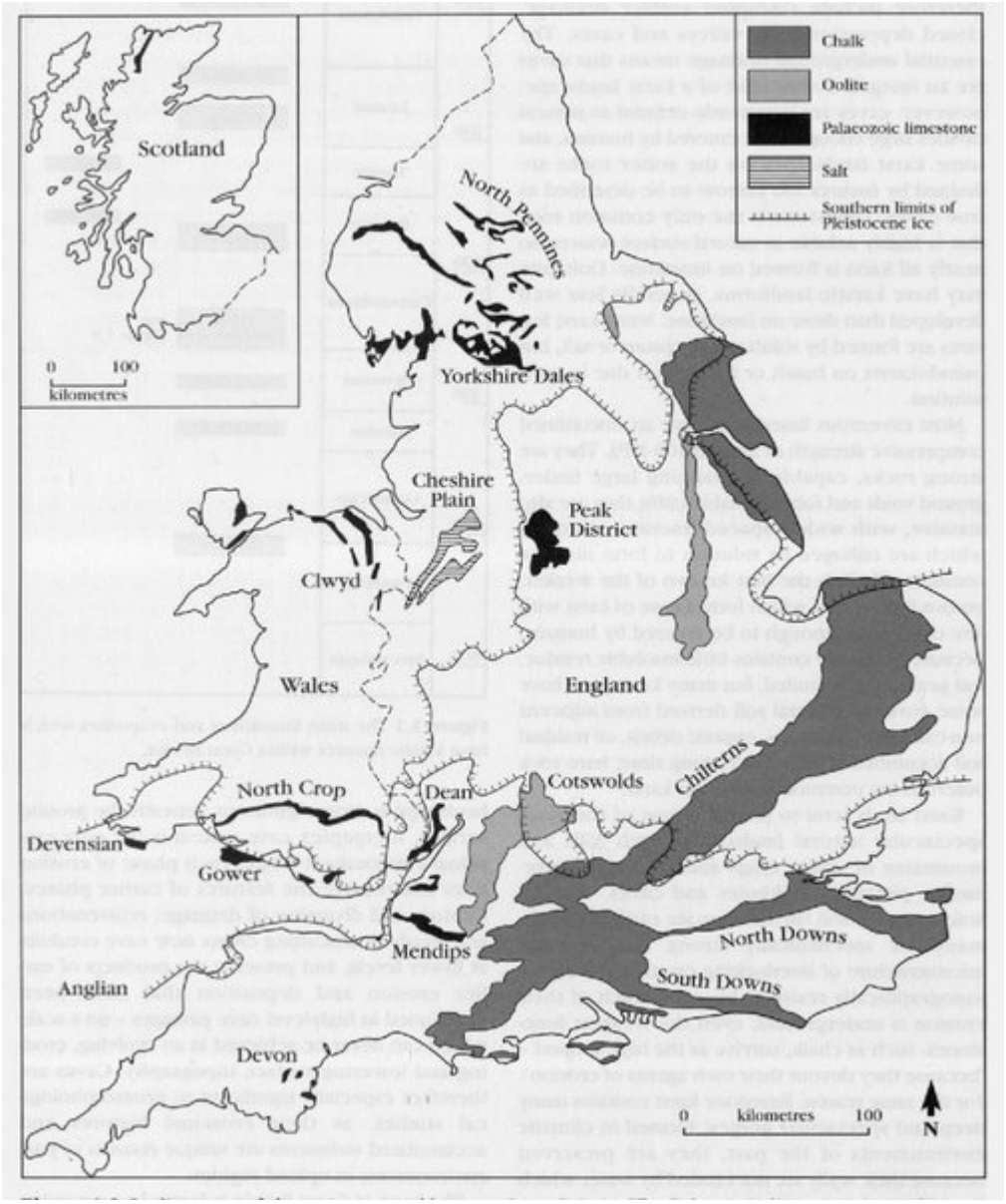
(Table 1.1) A comparison of the major features which give the individual character to each main karst region of Britain

(Table 1.2) The finest examples of individual karst and cave features within the GCR sites of Britain. The listing of features is in the order of their description in Chapter 1. The tabulated data are recognized as being subjective, especially among the important secondary examples, which are not presented in any sequence of merit and are referred to by short versions of their full site titles.

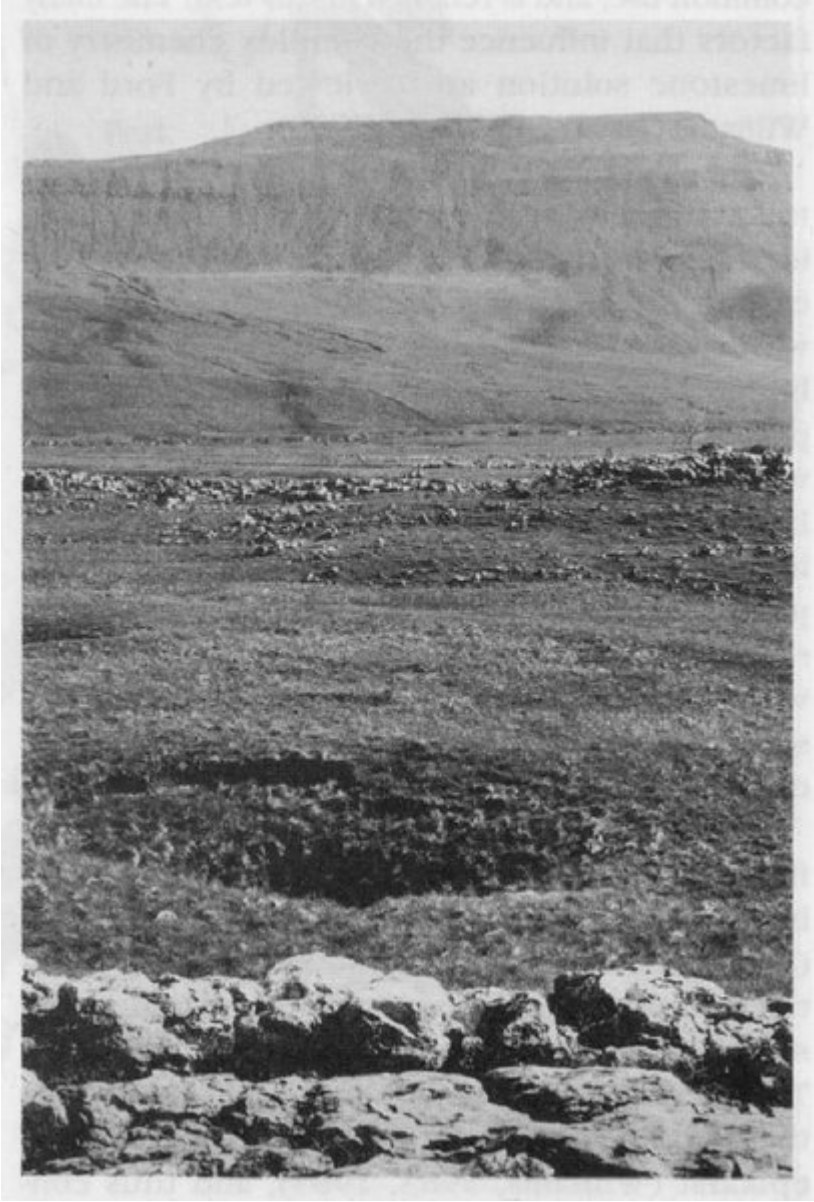
References



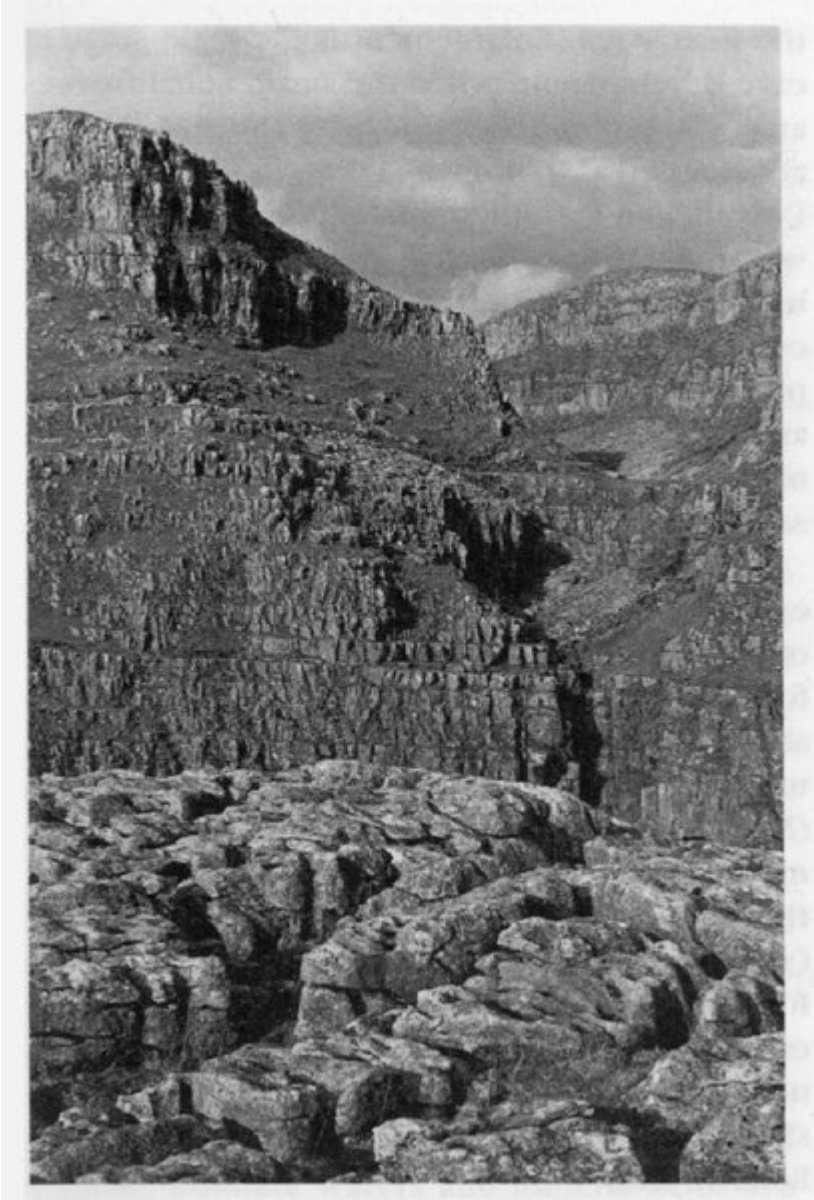
(Figure 1.1) The main limestones and evaporites which have karstic features within Great Britain.



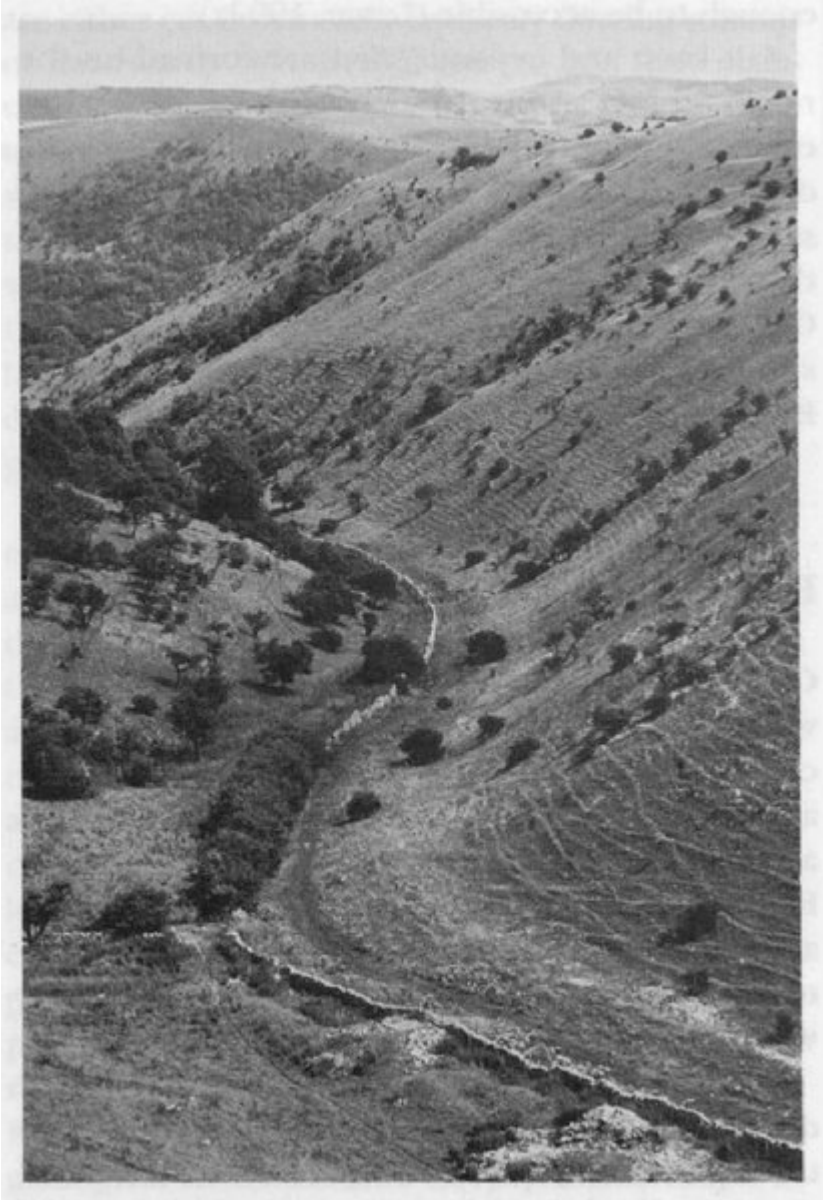
(Figure 1.2) Outline map of the main areas of karst in Great Britain. The Palaeozoic limestones are of Lower Carboniferous age, except for the Devonian limestone in Devon, and the Cambrian–Ordovician limestone in Scotland.



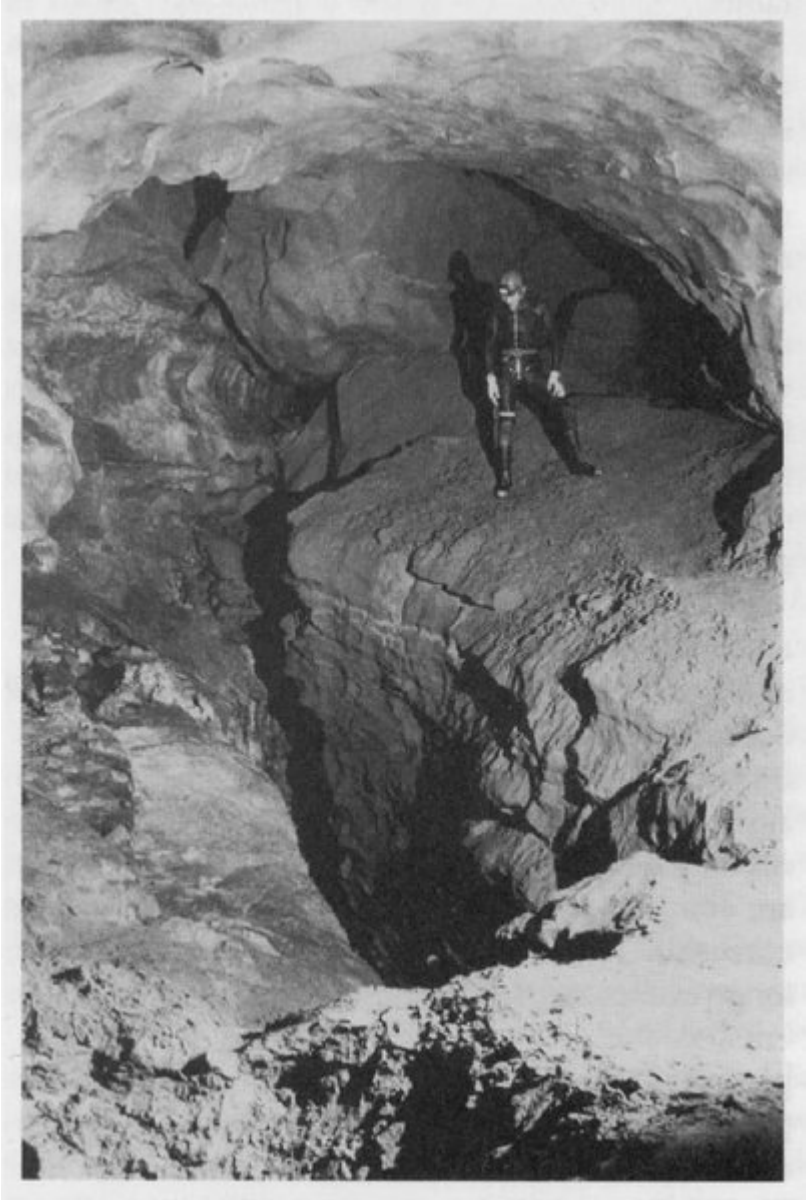
(Figure 1.3) A small subsidence doline, or shakehole, recently formed where the glacial till and soil cover have been washed into a fissure in the underlying limestone; on Ingleborough, in the Yorkshire Dales karst. (Photo: A.C.Waltham.)



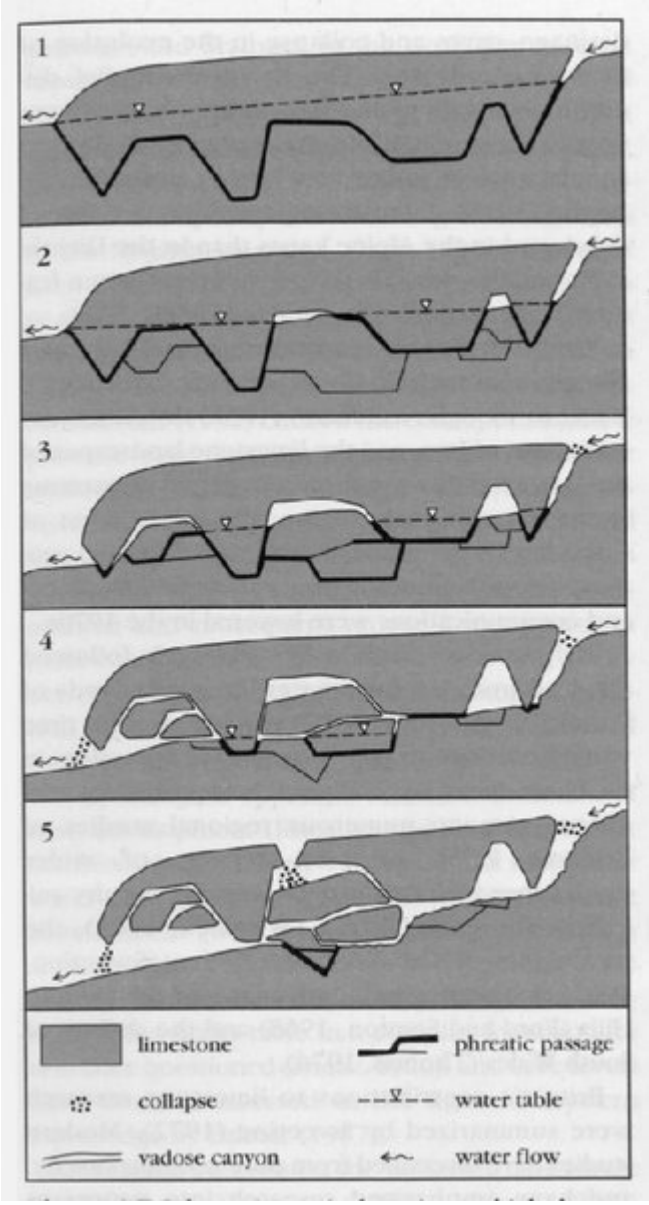
(Figure 1.4) The Yorkshire Dales glaciokarst, with bare cliffs and scars, limestone pavement and a fossil meltwater channel at Comb Scar, above Malham. (Photo: A.C. Waltham.)



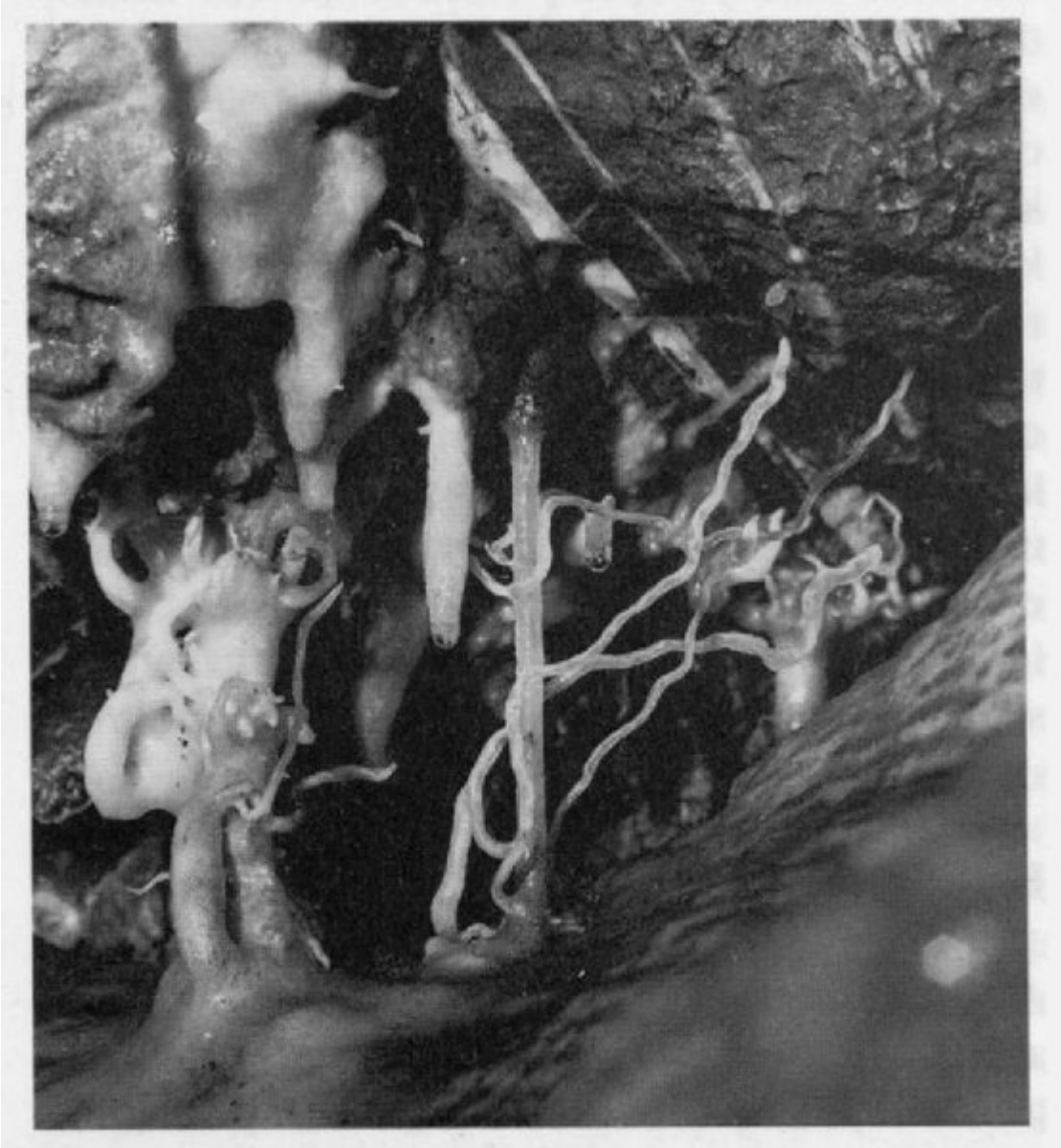
(Figure 1.5) The dry valley of Deep Dale, in the Peak District fluviokarst. (Photo: A.C. Waltham.)



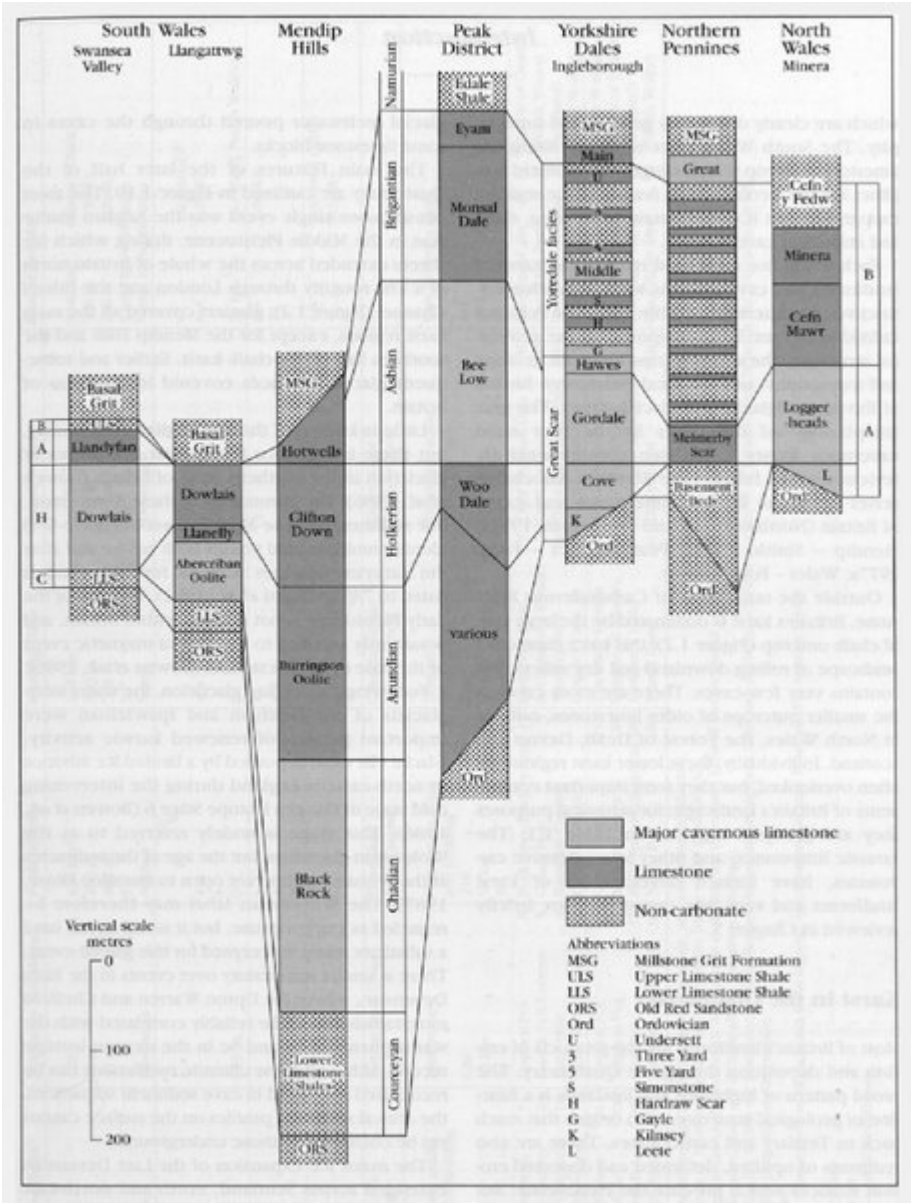
(Figure 1.6) The classic keyhole profile of a cave, where a drained phreatic tube has a vadose canyon cut in its floor; above the Far Streamway of White Scar Cave in the Yorkshire Dales karst. (Photo: A.C. Waltham.)



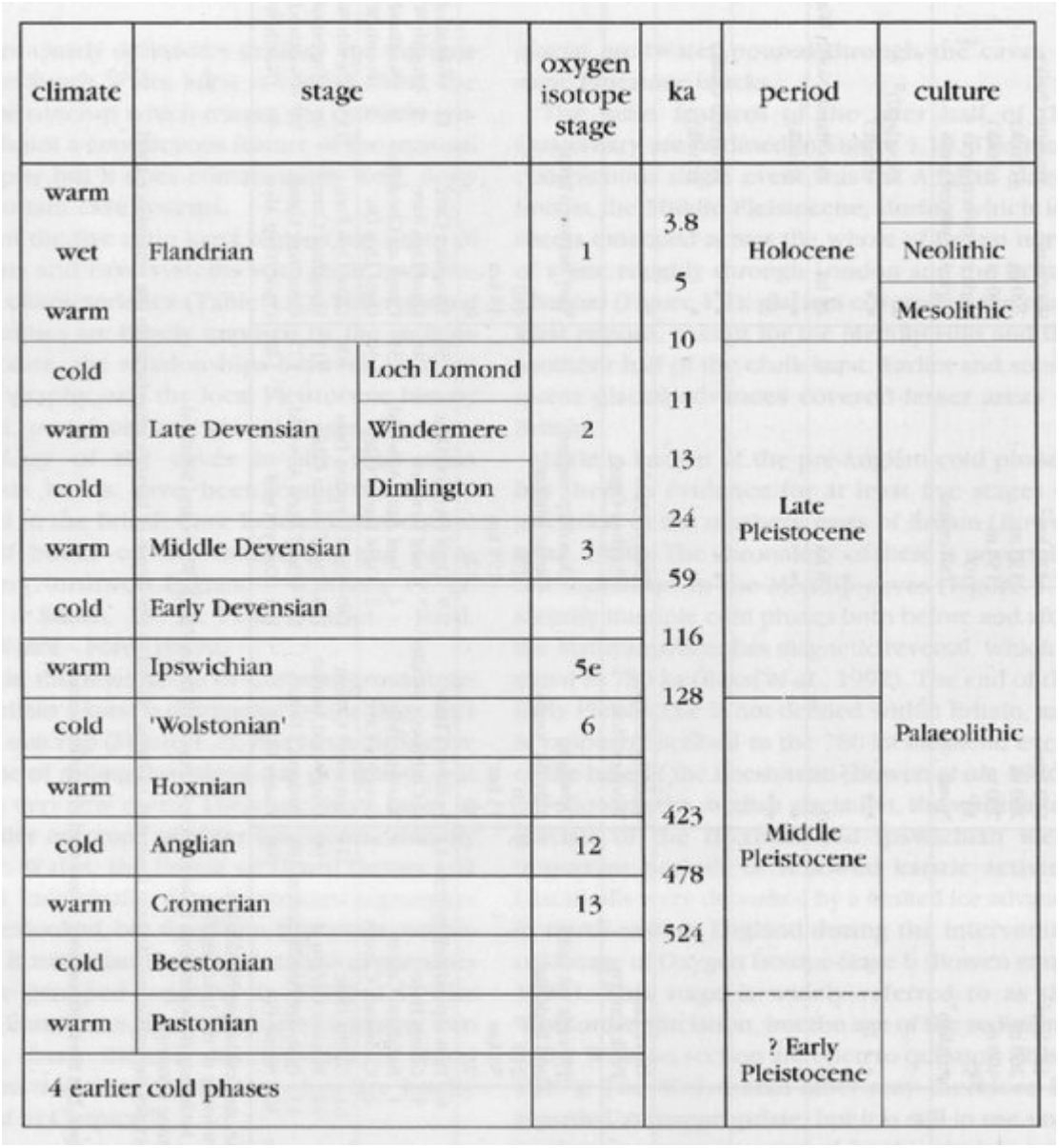
(Figure 1.7) Schematic vertical sections which demonstrate five stages in the evolution of a cave system in response to time and a falling base level. The early stages are mainly of phreatic re-routing and captures; the middle stages are dominated by the entrenchment of vadose canyons through the crests of the phreatic loops; the later stages continue the deepening of the vadose canyons. The model is based on Ogof Ffynnon Ddu, which is developed close to the strike direction in dipping limestones. The principles could apply to many other cave systems if the geometry of the passages was adapted to the local geological structure. (After Smart and Christopher, 1989.)



(Figure 1.8) Secondary deposition of calcite in a cave passage, forming straw stalactites, small stalagmites, a sloping flowstone floor and delicate helictites; in Withyhill Cave in the Mendip Hills karst. (Photo: J.R.Wooldridge.)

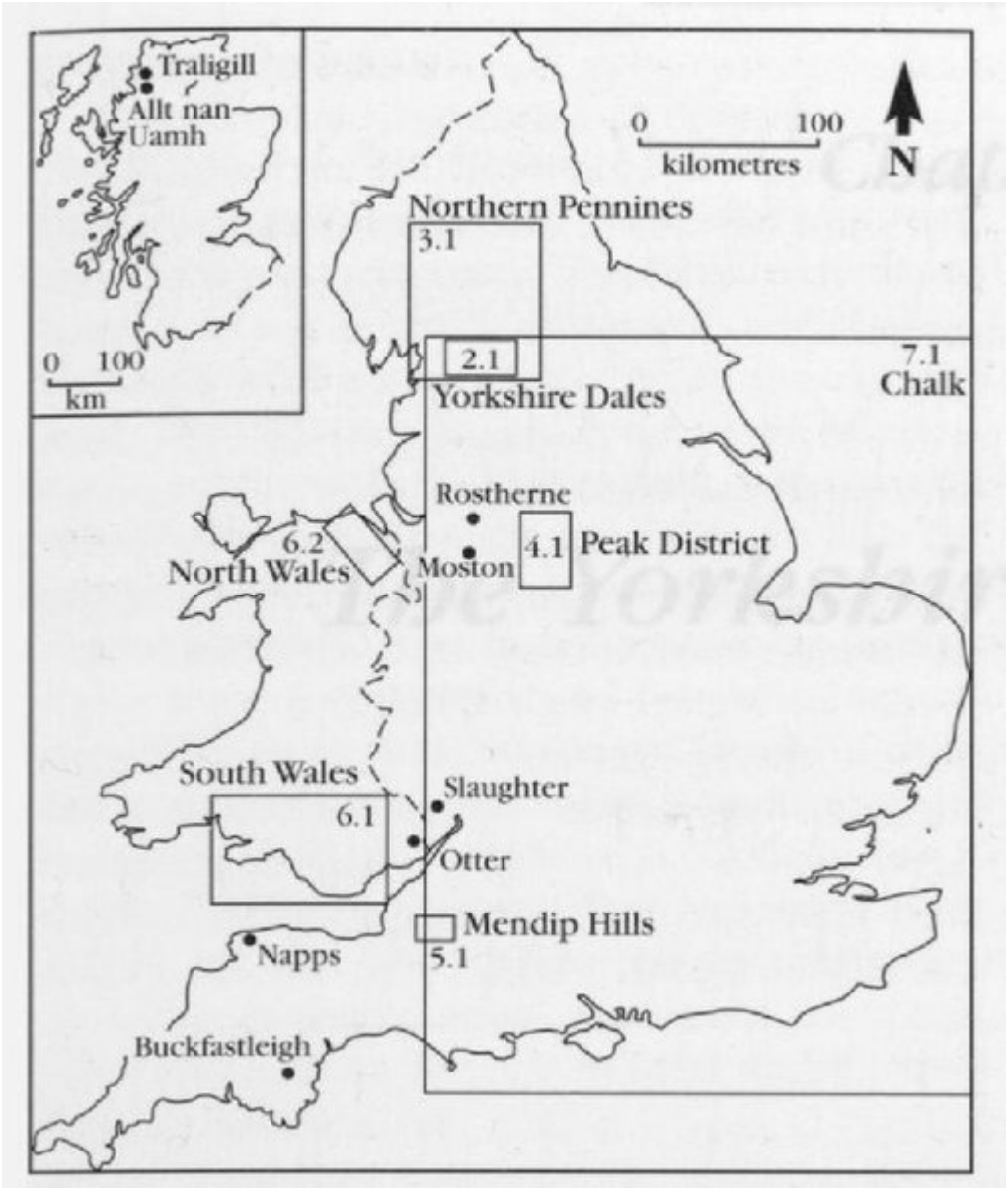


(Figure 1.9) The main limestone units of the Lower Carboniferous within the major karst region of Britain. Thicknesses are generalized as there are considerable lateral variations. All the limestones are Dinantian, except for the Namurian Main and Great Limestones of the Pennines. In the Yorkshire Dales karst, the Great Scar Limestone is the massive carbonate facies developed on the Askrigg Block, and the Yoredale facies belongs to the Brigantian Wensleydale Group. In South Wales the Abercriban Oolite Group includes the Blaen Onneu Oolite. The main cover and basement rocks are identified; the Cefn y Fedw Sandstone extends across thp Brigantian/Namurian boundary. All the named limestones are karstified to some extent, but the major cavernous units are distinguished. (Largely after George et al., 1976; Arthurton et al., 1988; Lowe, 1989a.)

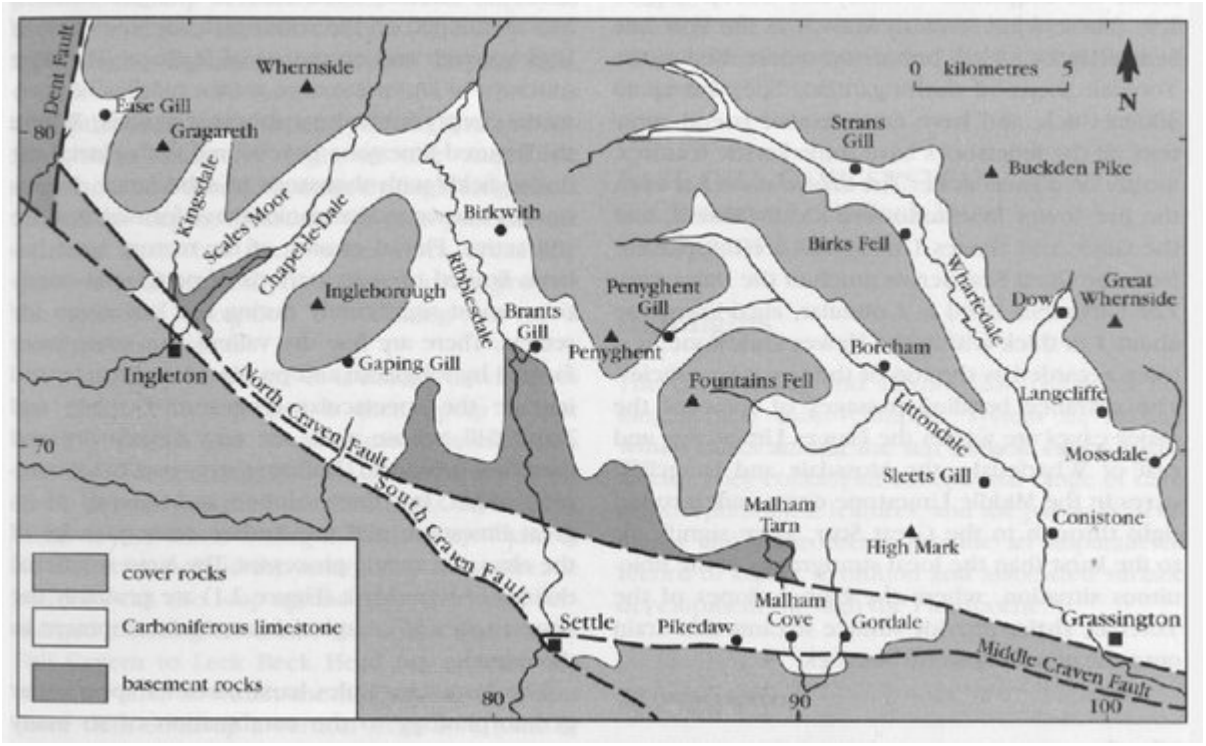


climate	stage		oxygen isotope stage	ka	period	culture
warm	Flandrian		1	3.8	Holocene	
wet				5		Neolithic
warm				10		Mesolithic
cold	Late Devensian	Loch Lomond	2	11	Late Pleistocene	Palaeolithic
warm		Windermere		13		
cold		Dimlington		24		
warm	Middle Devensian		3	59		
cold	Early Devensian			116		
warm	Ipswichian		5e	128		
cold	'Wolstonian'		6		Middle Pleistocene	
warm	Hoxnian			423		
cold	Anglian		12	478		
warm	Cromerian		13	524		
cold	Beestonian				? Early Pleistocene	
warm	Pastonian					
4 earlier cold phases						

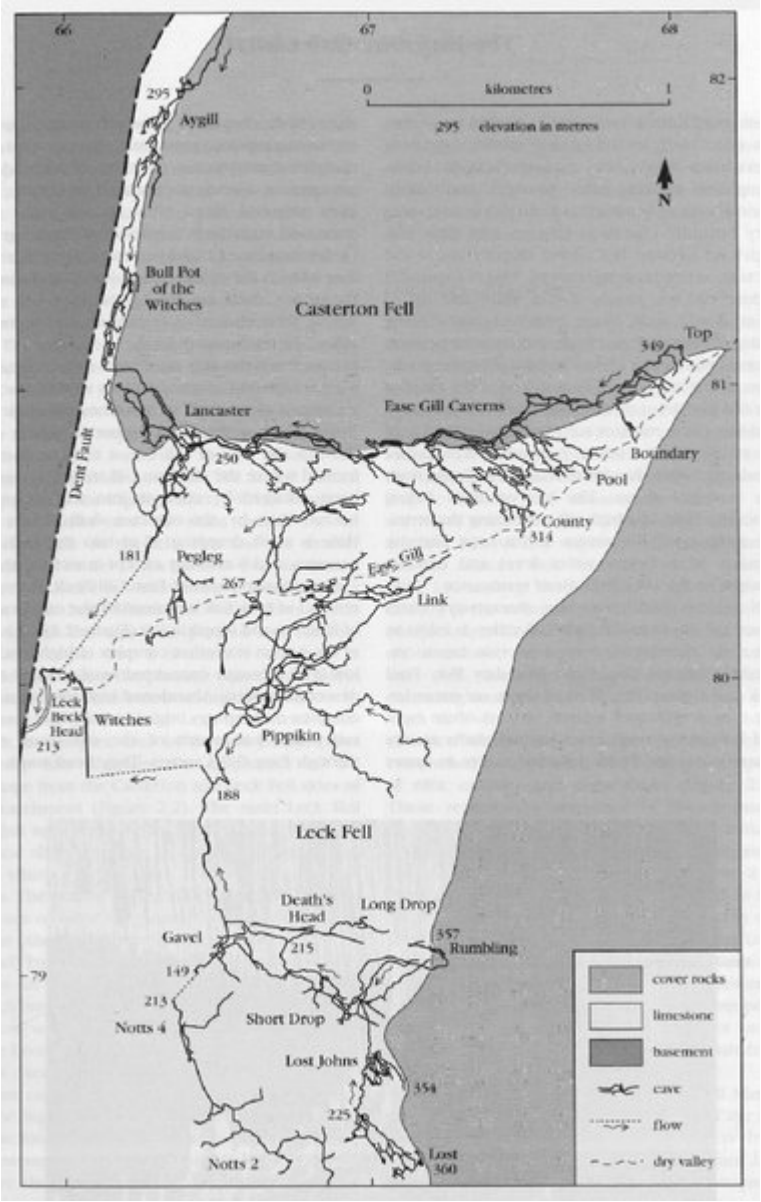
(Figure 1.10) The major glaciations and climatic variations, stages and subdivisions, and cultural phases, of the later parts of the Quaternary. The chronology is based on terrestrial material since about 120 ka, and on correlation with the earlier oxygen isotope stages in the marine sediment record. A more complex pattern of climatic variations is known to exist; both they and other debatable correlations are omitted. The problems of the Early Devensian subdivisions, the 'Wolstonian' glaciation and the Early/Middle Pleistocene boundary are referred to in the text. (After Imbrie et al., 1984; Bowen et al., 1986; Martinson et al., 1987; Campbell & Bowen, 1989; Shackleton et al., 1990.)



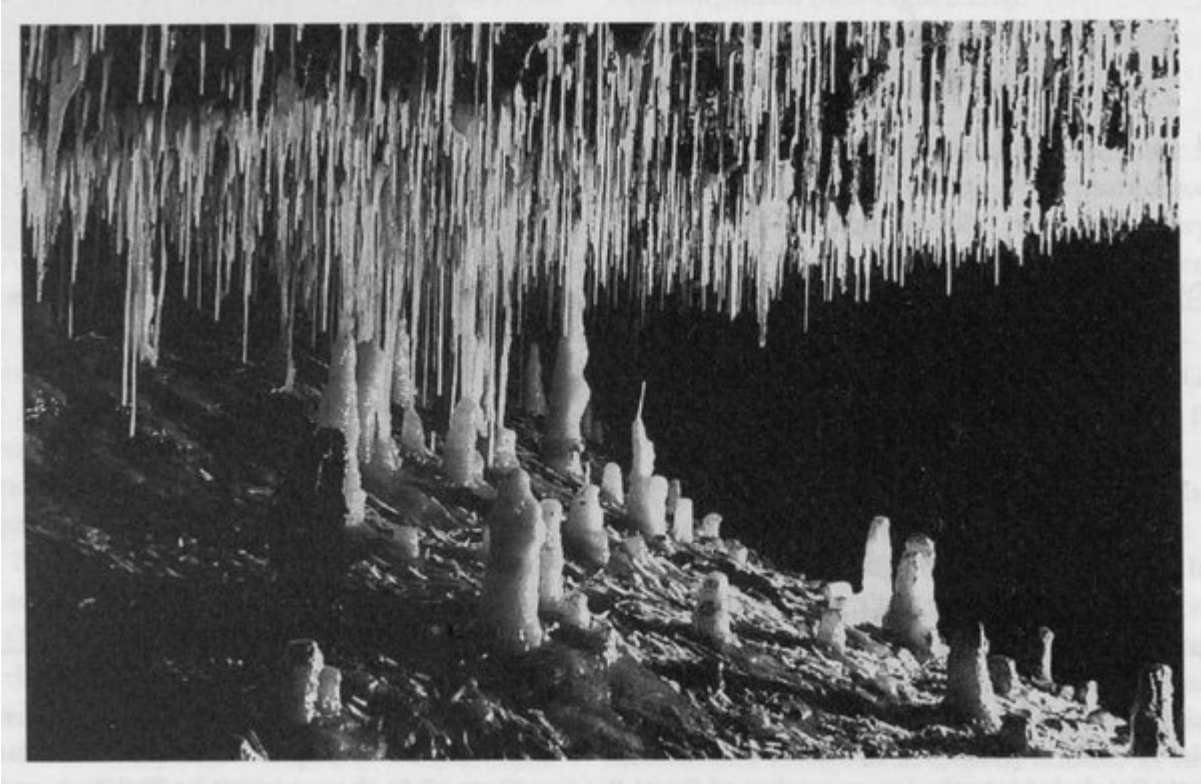
(Figure 1.11) Key map showing the coverage of location maps in each chapter, identified by their figure numbers, and also the location of sites which are documented in the text but fall outside the chapter location maps.



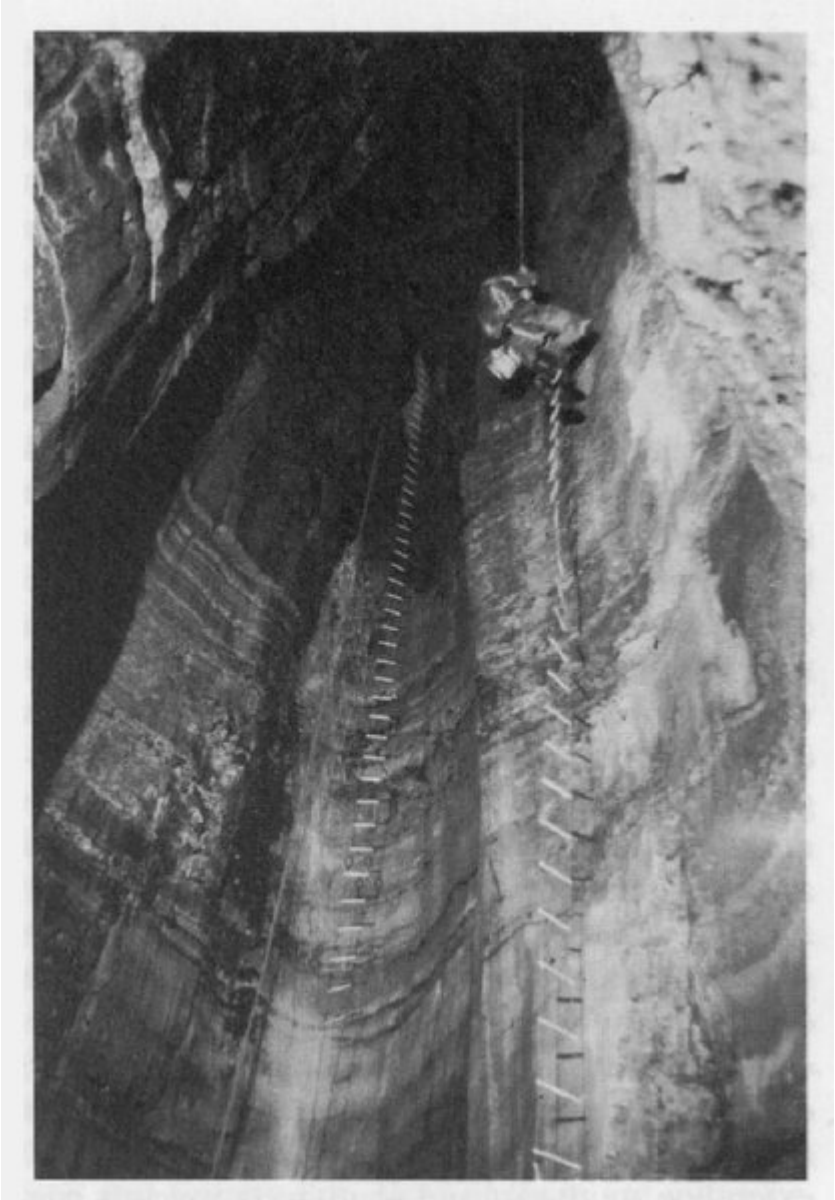
(Figure 2.1) Outline map of the Yorkshire Dales karst, with locations referred to in the text. The Carboniferous limestone shown includes all the Great Scar Limestone (Kilnsey, Cove and Gordale Formations) and also the lower Yoredale limestones (of the Wensleydale Group) where they are hydrologically linked to the Great Scar and are therefore part of the same karst unit. Higher limestones within the Yoredale Series are not marked. Basement rocks are Palaeozoic slates and greywackes. Cover rocks are the Yoredale facies of the middle and late Brigantian Wensleydale Formation and various Upper Carboniferous and Permian clastic formations.



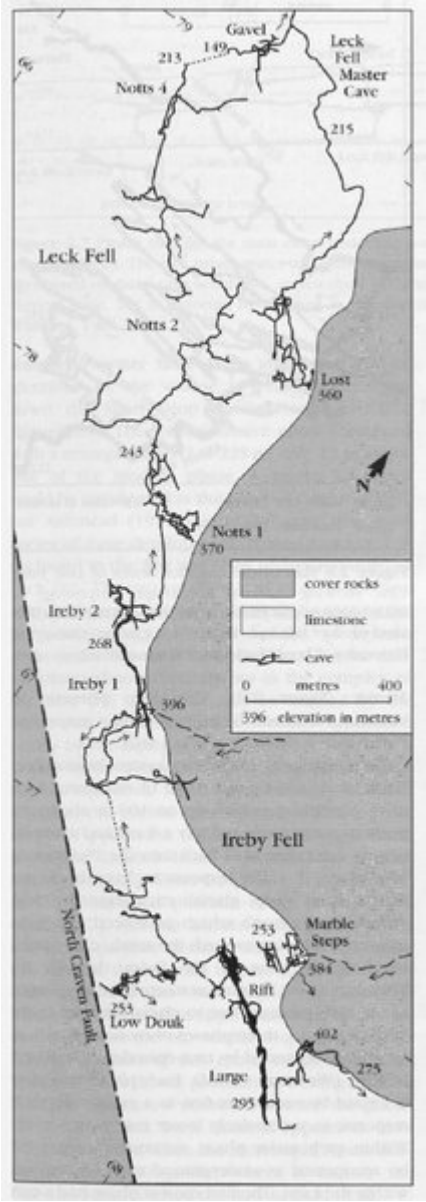
(Figure 2.2) Outline map of the Ease Gill Cave System. Limestone is the Great Scar Limestone. Basement rocks are Silurian clastics only exposed west of the Dent Fault. Cover rocks are Yoredale and Namurian shales and sandstones. Notts Pot drains into the lower reaches of Gavel Pot (see Figure 2.5) (from surveys by Red Rose and Happy Wanderers Caving and Potholing Clubs, Northern Pennine Club, Cave Diving Group and many others.)



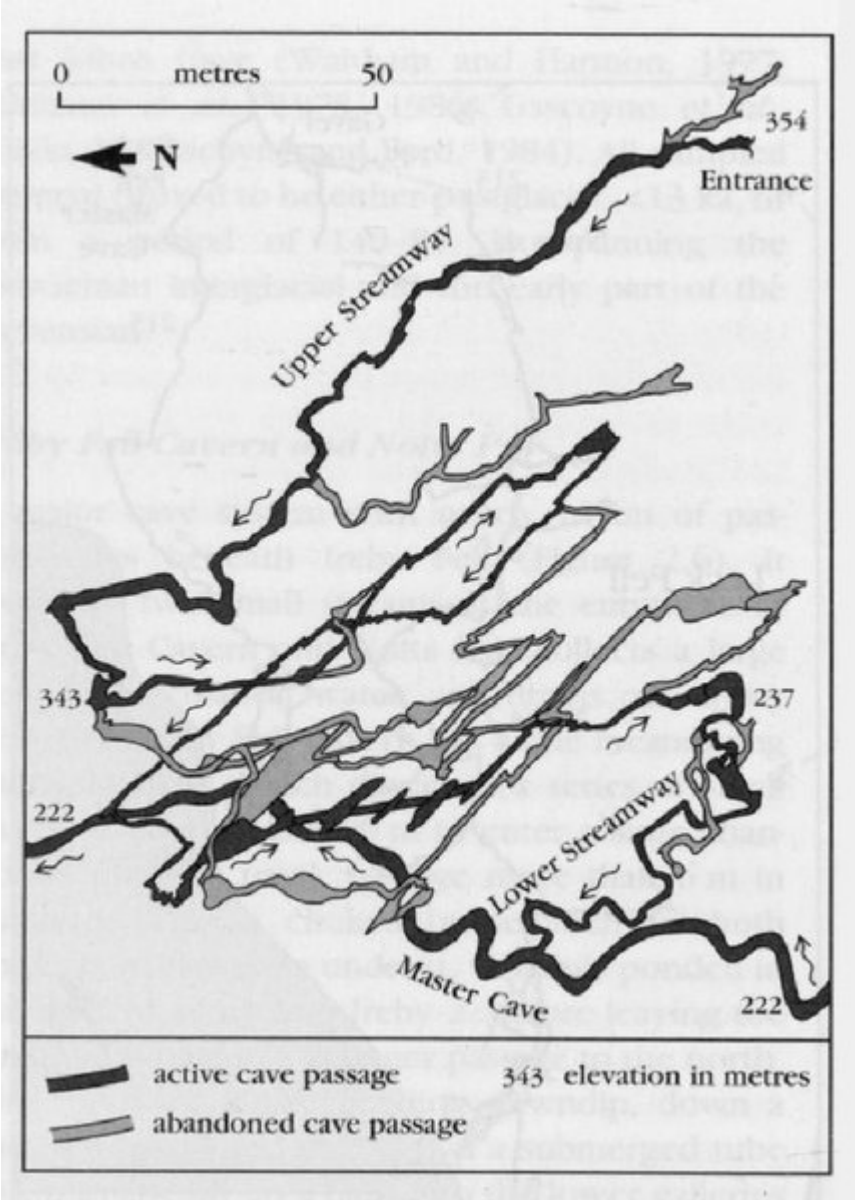
(Figure 2.3) Straw stalactites and short stalagmites form a spectacular display in Easter Grotto, part of the high-level passages in Ease Gill Caverns. (Photo: A.C. Waltham.)



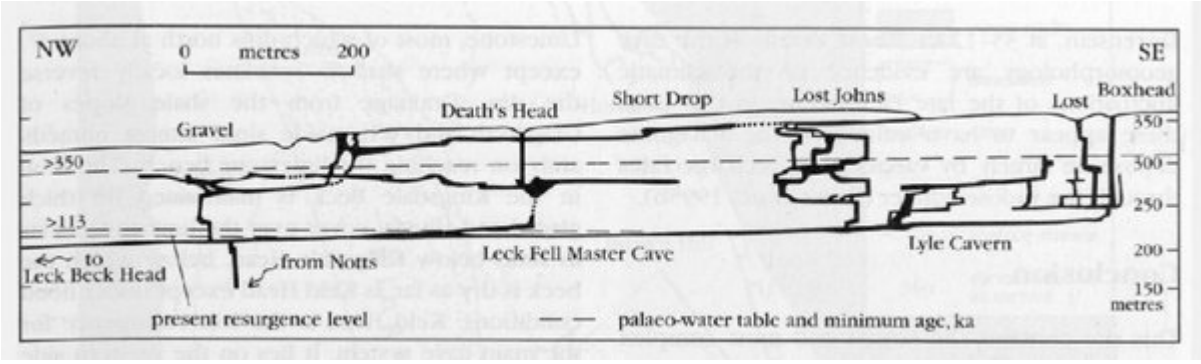
(Figure 2.4) A few horizontal bedding planes score the cleanly washed walls of the waterfall shaft at Wet Pitch in Lost Johns Cave. (Photo: A.C. Waltham.)



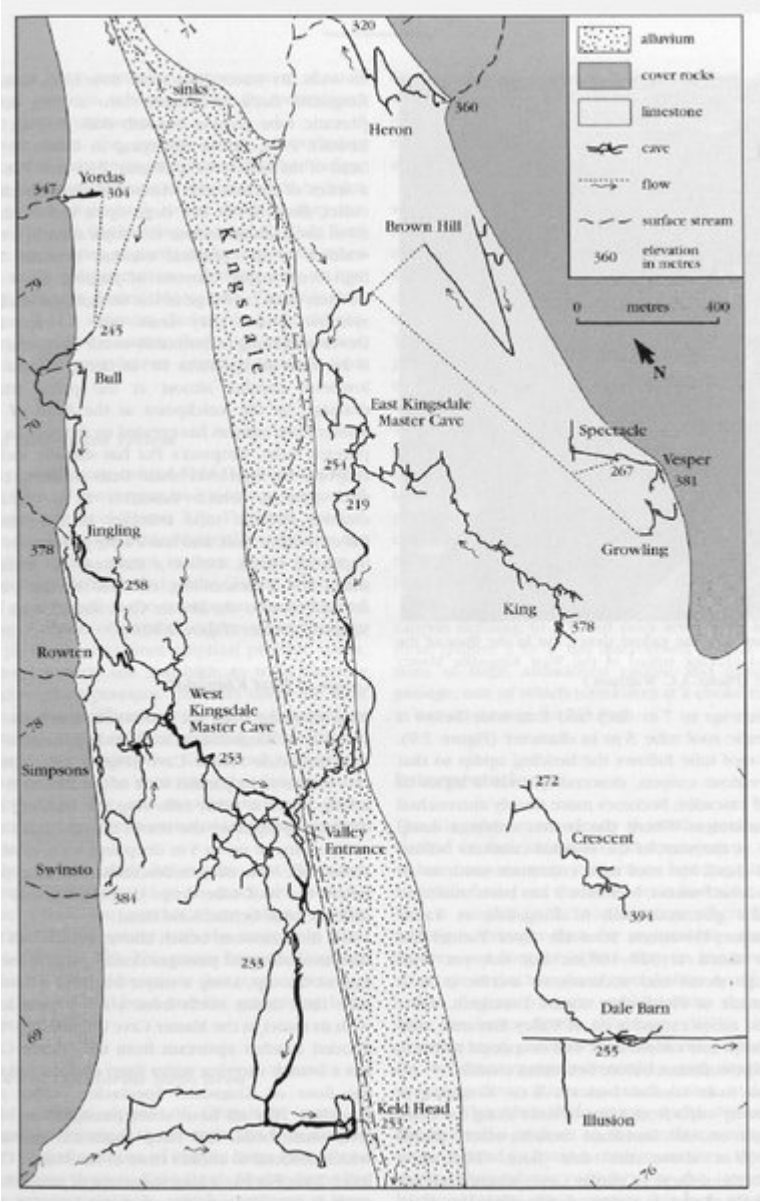
(Figure 2.5) Outline map of the cave systems under the southern flank of Gragareth. Ireby Cavern and Notts Pot drain north into the Ease Gill Cave System, joining the water from the Leck Fell Master Cave, where the high-level passages in Lost Johns and Short Drop Caves have been omitted for clarity (see Figure 2.2); Marble Steps and Large Pot drain east to Keld Head (see Figure 2.8) (from surveys by Northern Pennine Club, Northern Cave Club and others).



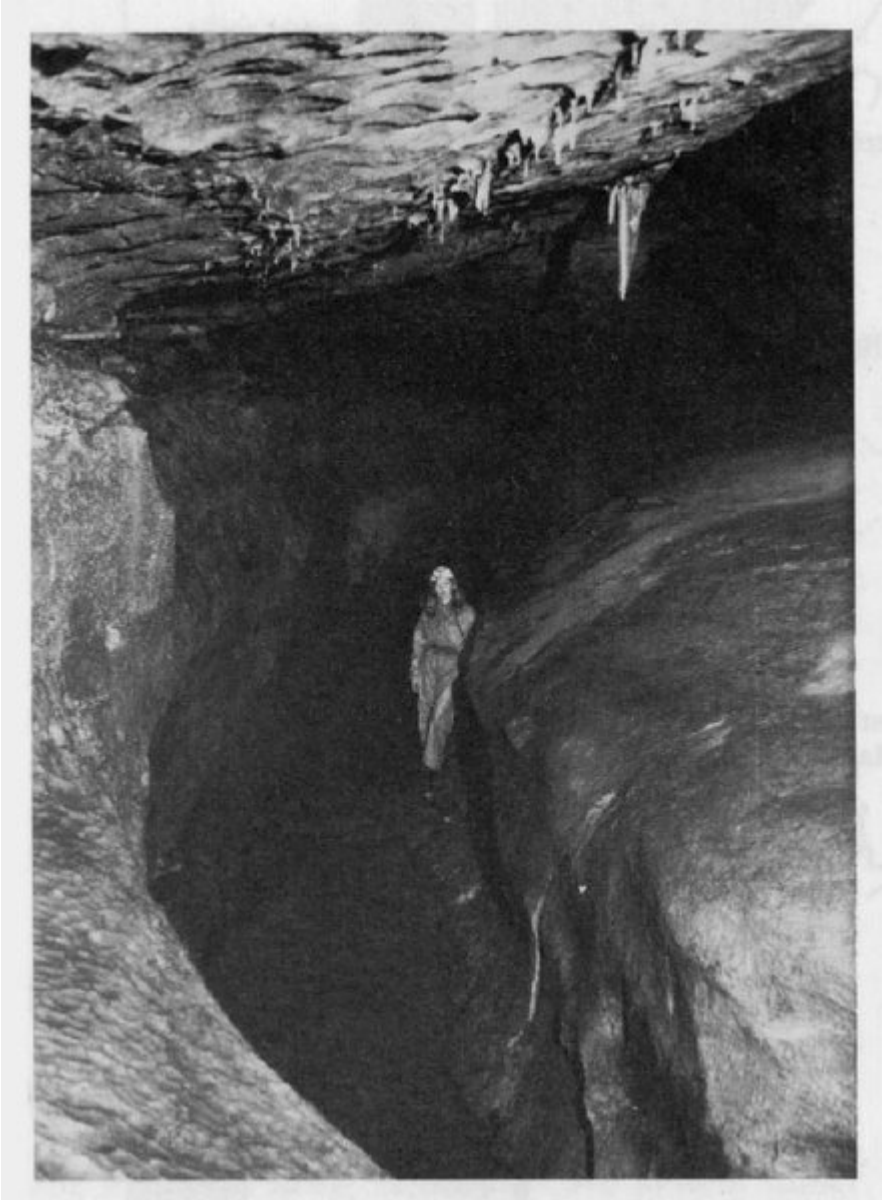
(Figure 2.6) Map of the Entrance Series of Lost Johns Cave showing contrasts in passage morphology on shale horizons and joints, as described in the text (from surveys by London University Caving Clubs and University of Leeds Speleological Association).



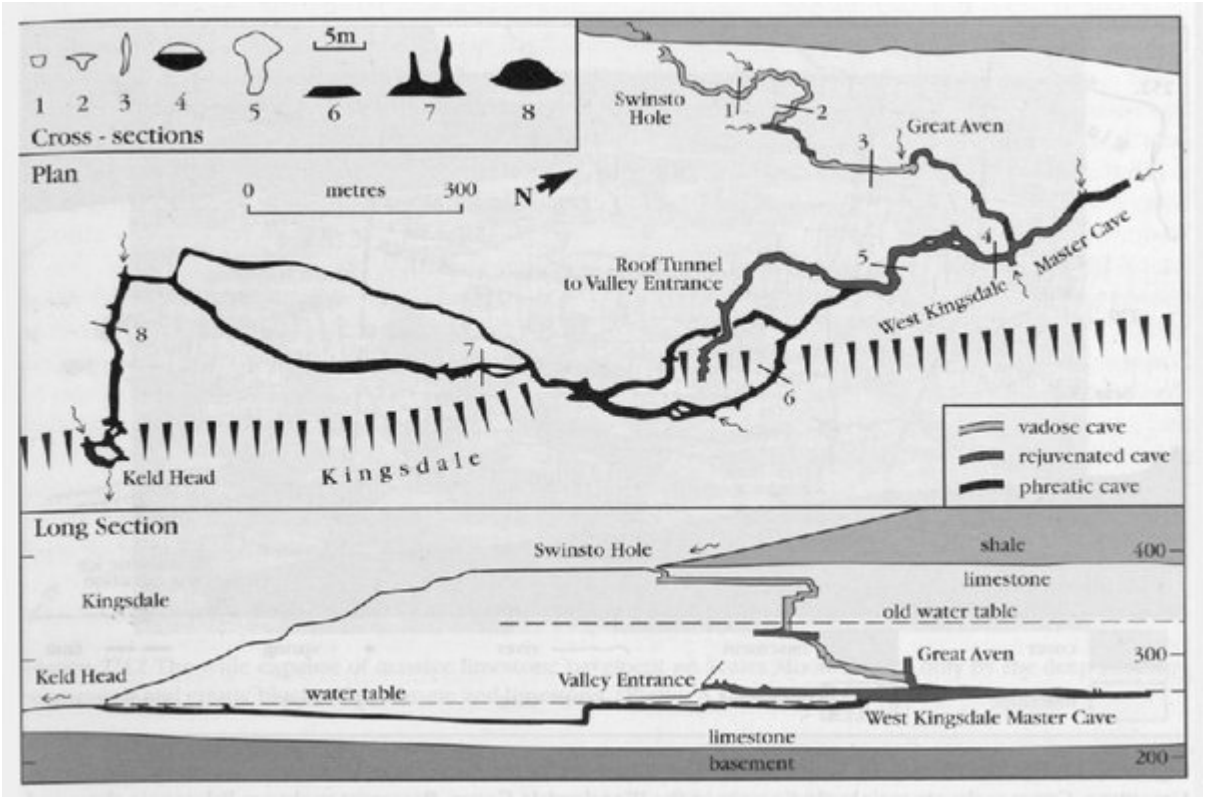
(Figure 2.7) Profile through the main caves under the southern part of Leek Fell, with many passages omitted to improve clarity. The two palaeowater tables are recognized from the cave morphology, and are ascribed minimum ages based on dated cave sediments, as described in the text. The horizontal scale is approximately the same as the vertical scale, but is distorted by changes in the direction of projection. (After Waltham and Hatherley, 1983; Waltham, 1986.)



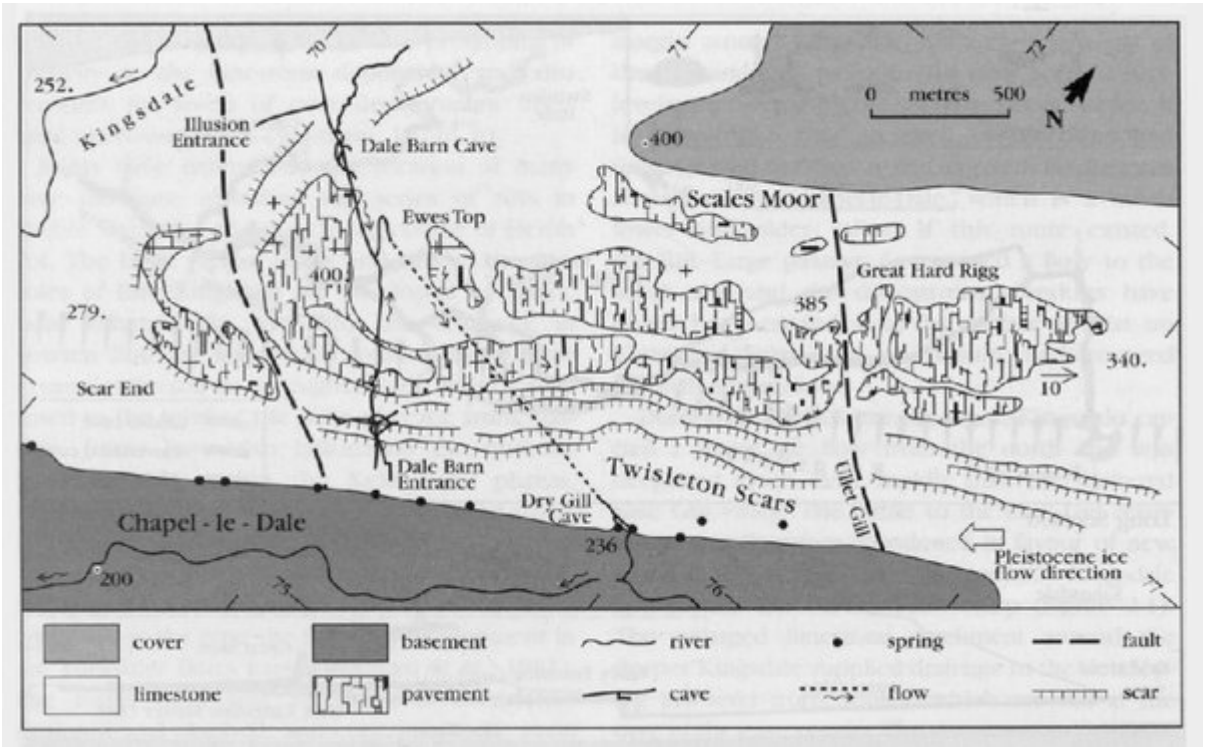
(Figure 2.8) Outline map of the caves of Kingsdale. These include 7.5 km of caves behind Keld Head, at the southern end of the system and beneath the valley floor, which are totally flooded (from surveys by University of Leeds Speleological Association, Cave Diving Group and others).



(Figure 2.9) The vadose trench cut in the floor of the broad phreatic tunnel in the West Kingsdale Master Cave. (Photo: A.C. Waltham.)

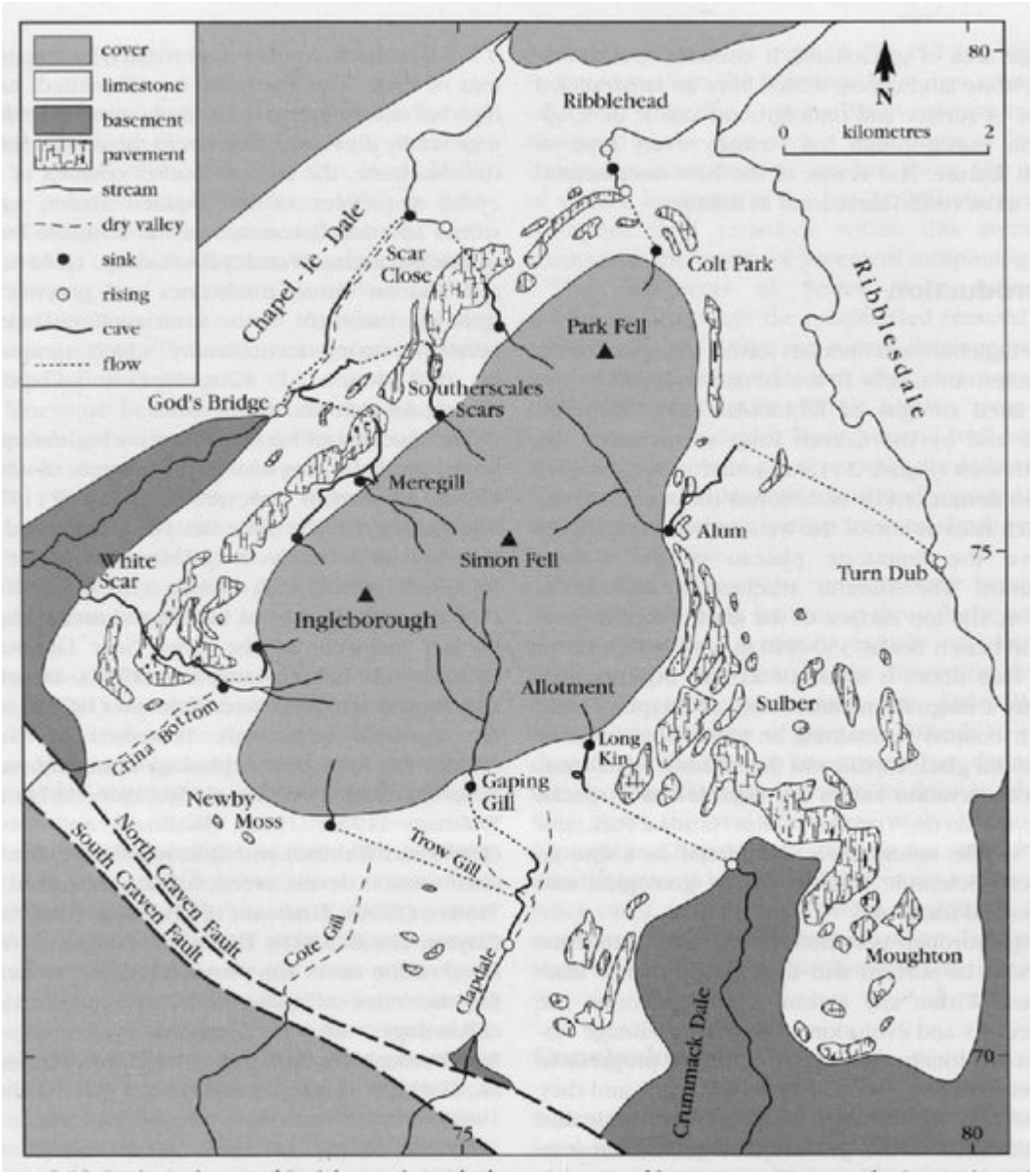


(Figure 2.10) Swinsto Hole to Keld Head, the type example of a Yorkshire Dales cave, and part of the Kingsdale cave system. Only the main passages along the underground drainage route are shown; there are additional vadose inlets, abandoned passages and phreatic loops. The vertical scale of the long section is exaggerated by a factor of 1.5. (Mainly after Waltham et al., 1981.)

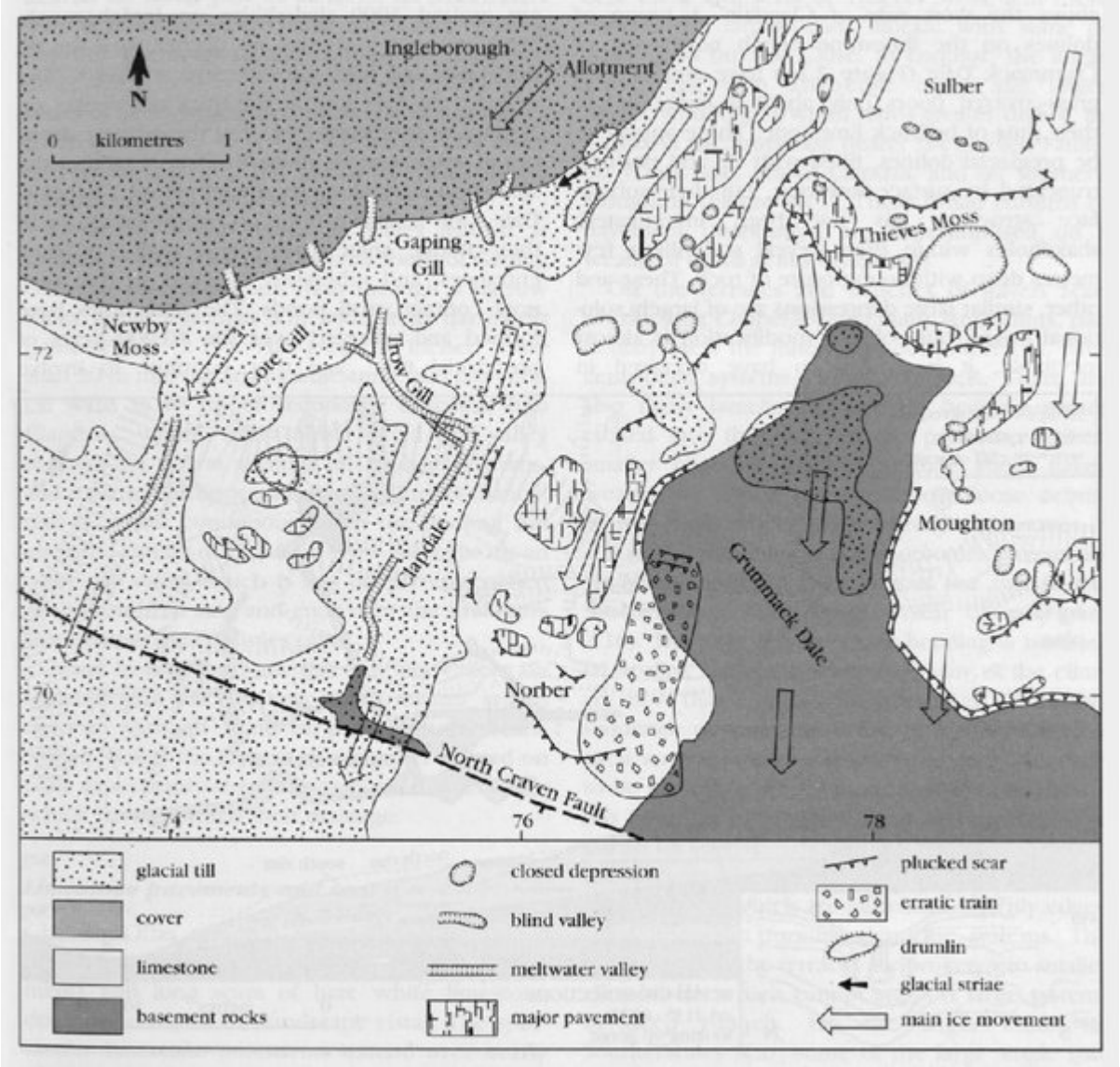


(Figure 2.11) Geological map of Scales Moor. The limestone is the Great Scar Limestone, including the Hawes Limestone. Cover rocks are mainly clastic units in the Wensleydale Group. Basement rocks are Palaeozoic slates and greywackes. Only the larger areas of pavement are marked, and there are thin strips of pavement along the crest of nearly all the scars. Dale Barn Cave lies close to the base of the limestone, about 150 m below the main limestone pavements (cave survey from Northern Cave Club).

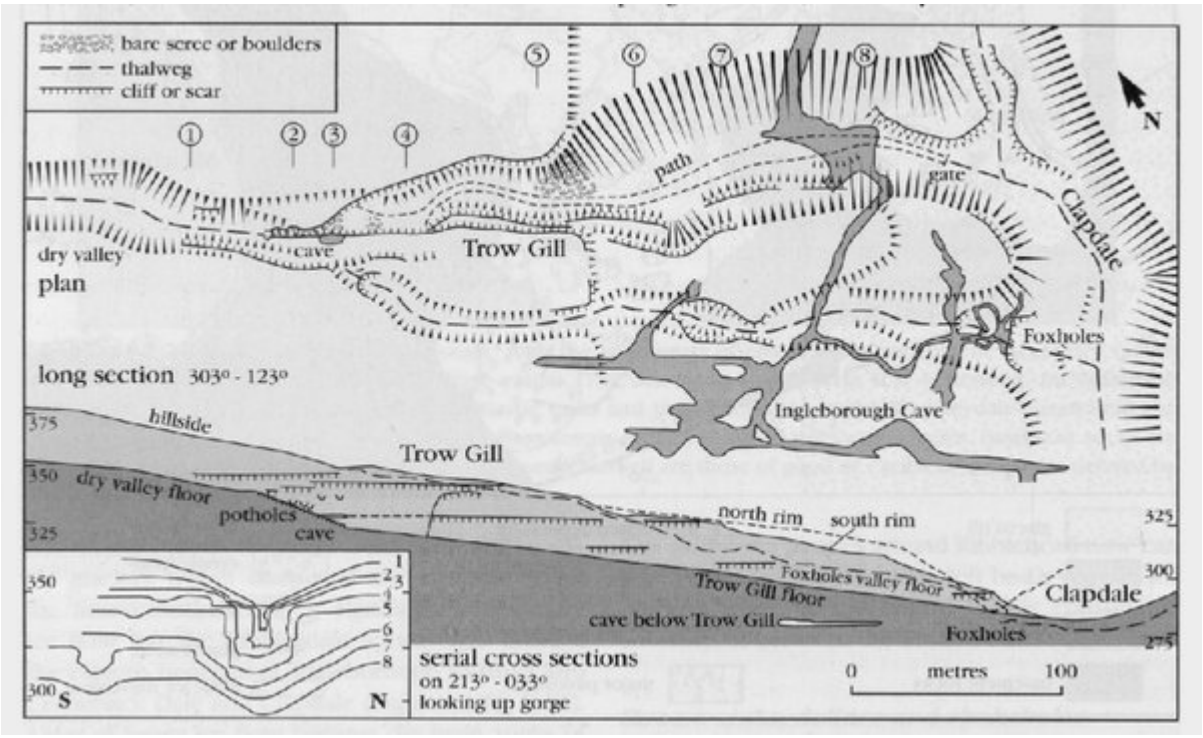
(Figure 2.12) The wide expanse of massive limestone pavement on Scales Moor, broken only by the deep rundkarren runnels and erratic blocks of sandstone and limestone. (Photo: A.C. Waltham.)



(Figure 2.13) Geological map of Ingleborough, with the main areas of limestone pavement, the larger dry valleys and some of the main underground drainage routes. The limestone is the Great Scar Limestone, including the Hawes Limestone. Cover rocks are various clastic units and thin limestones in the Wensleydale Group and the Namurian Millstone Grit Group, and Upper Carboniferous clastics south of the Craven Faults. Basement rocks are Palaeozoic slates and greywackes. The only pavements marked are those of good or excellent quality (as defined by Waltham and Tillotson, 1989).

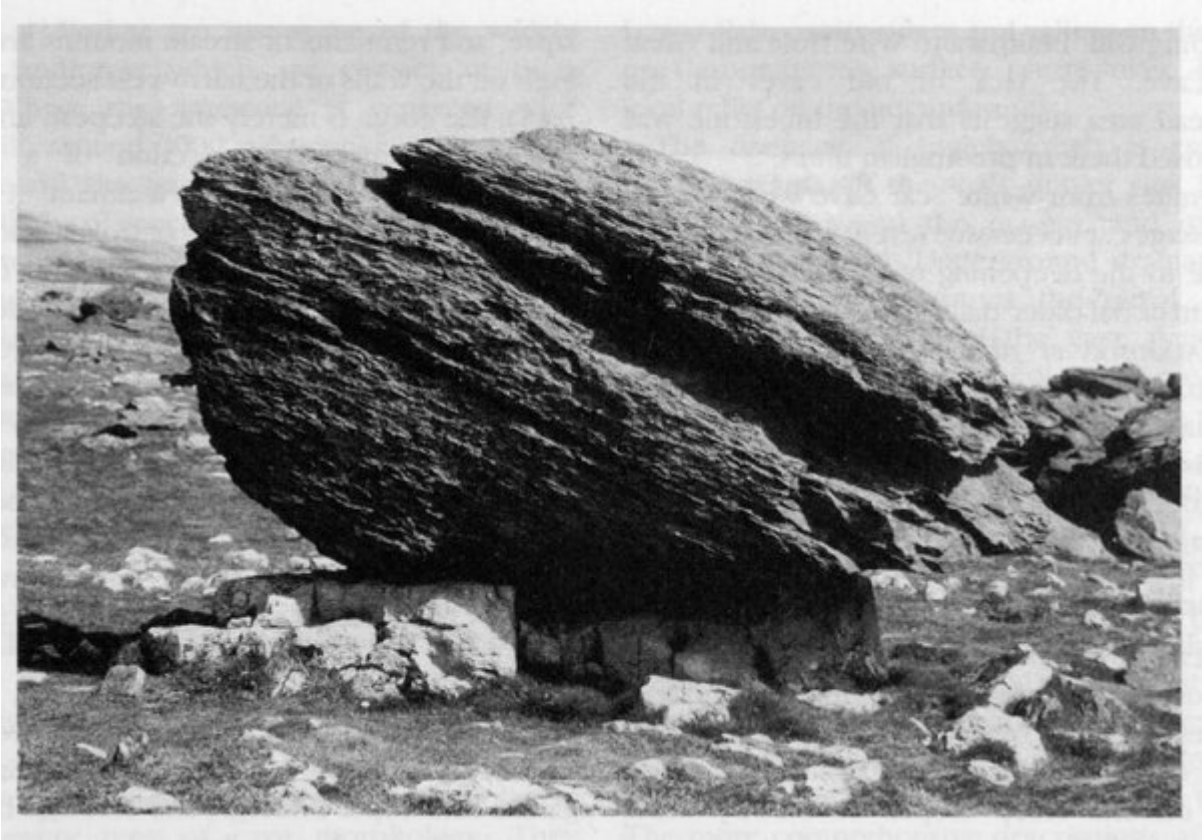


(Figure 2.14) Geomorphological map of the southern sector of Ingleborough. The main pavements in the eastern half of the map area were scoured by ice moving down Ribblesdale, while the limestone in the western half is extensively veneered by glacial till deposited in the lee of the Ingleborough summit mass (from Waltham, 1990).

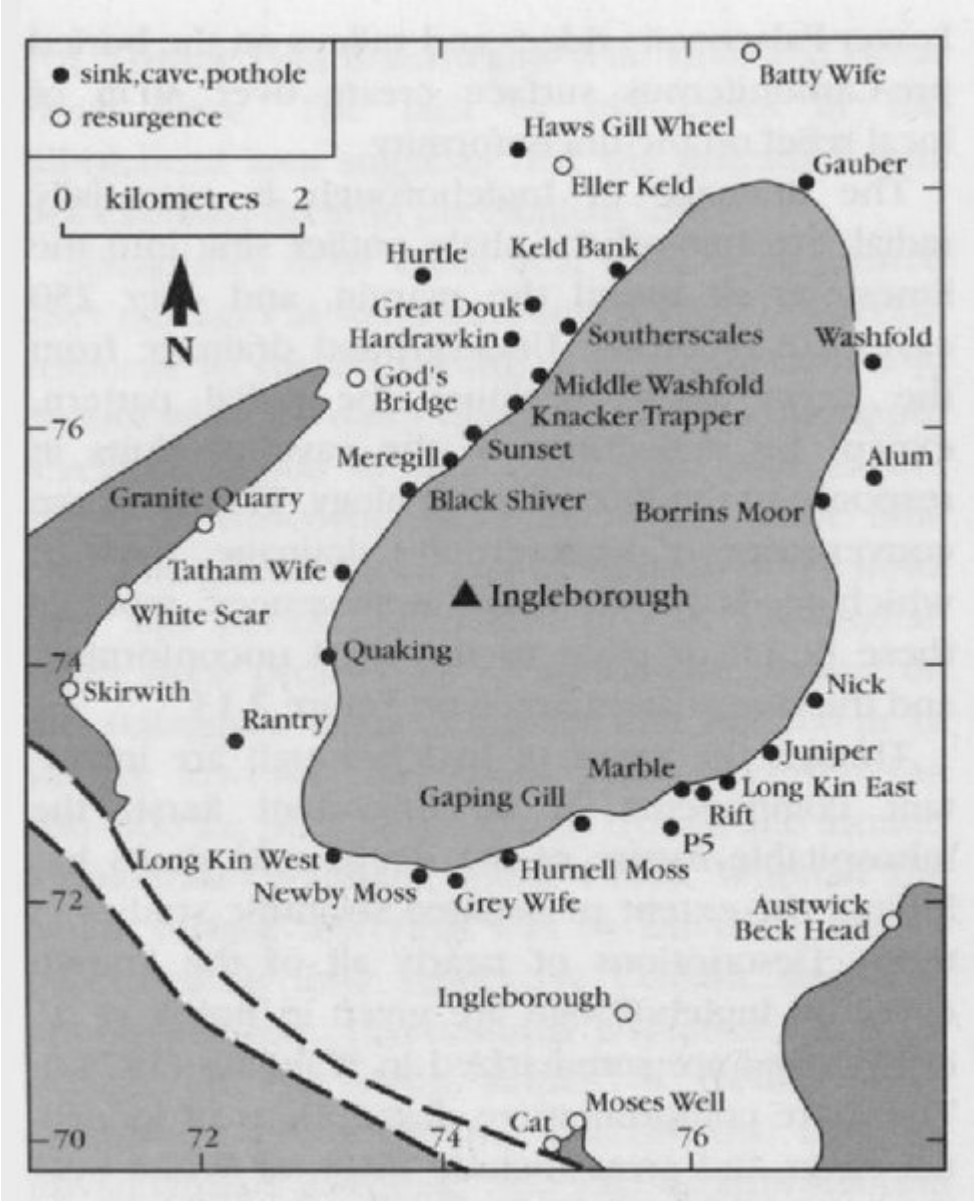


(Figure 2.15) Topographic map and projected long profiles of Trow Gill and the underlying caves. Some cave passages have been omitted to improve clarity, and all the caves lie below the level reached on the serial cross-sections; the thalweg down Trow Gill lies along the centreline of the path (from Waltham, 1990).

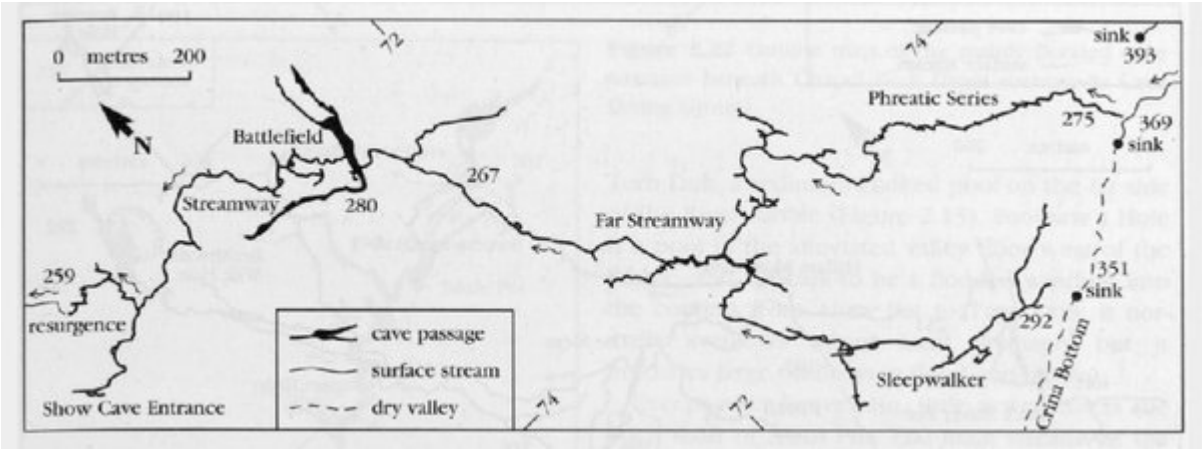
(Figure 2.16) The limestone pavements of Southerscales Scars, on the north-western bench of Ingleborough. (Photo: A.C. Waltham.)



(Figure 2.17) Glacial erratic of Silurian greywacke on the Norber bench of southern Ingleborough. The erratic is 2 m across and stands on a plinth of limestone which has been protected from solution by direct rainfall. (Photo: A.C. Waltham.)

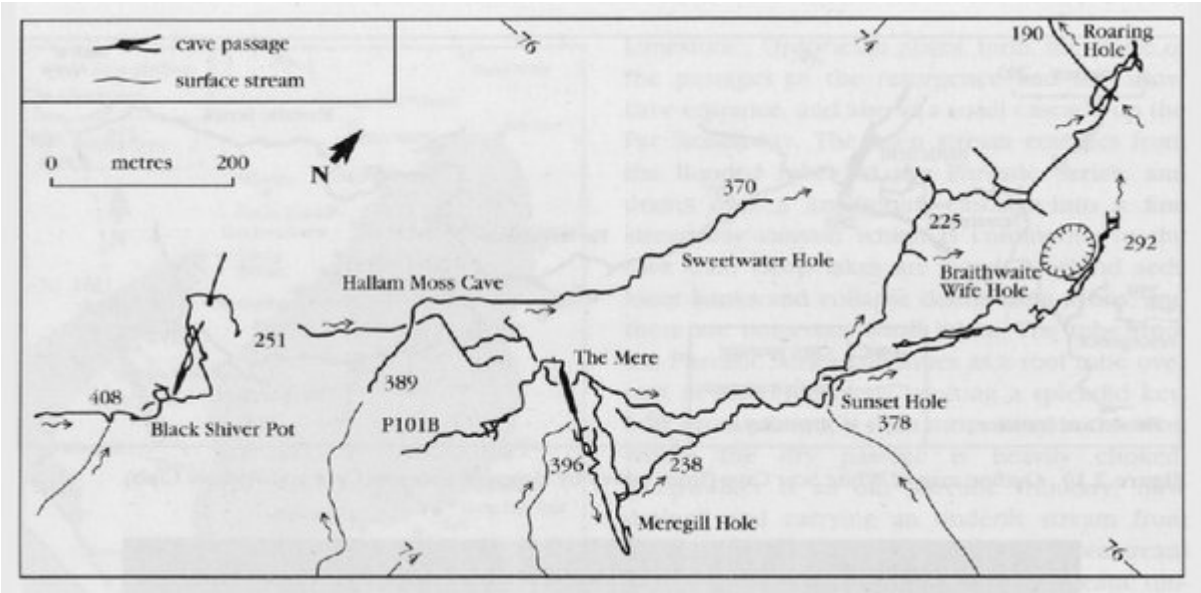


(Figure 2.18) Outline map of Ingleborough, with locations of the main caves referred to in the text. Geology as in Figure 2.13.

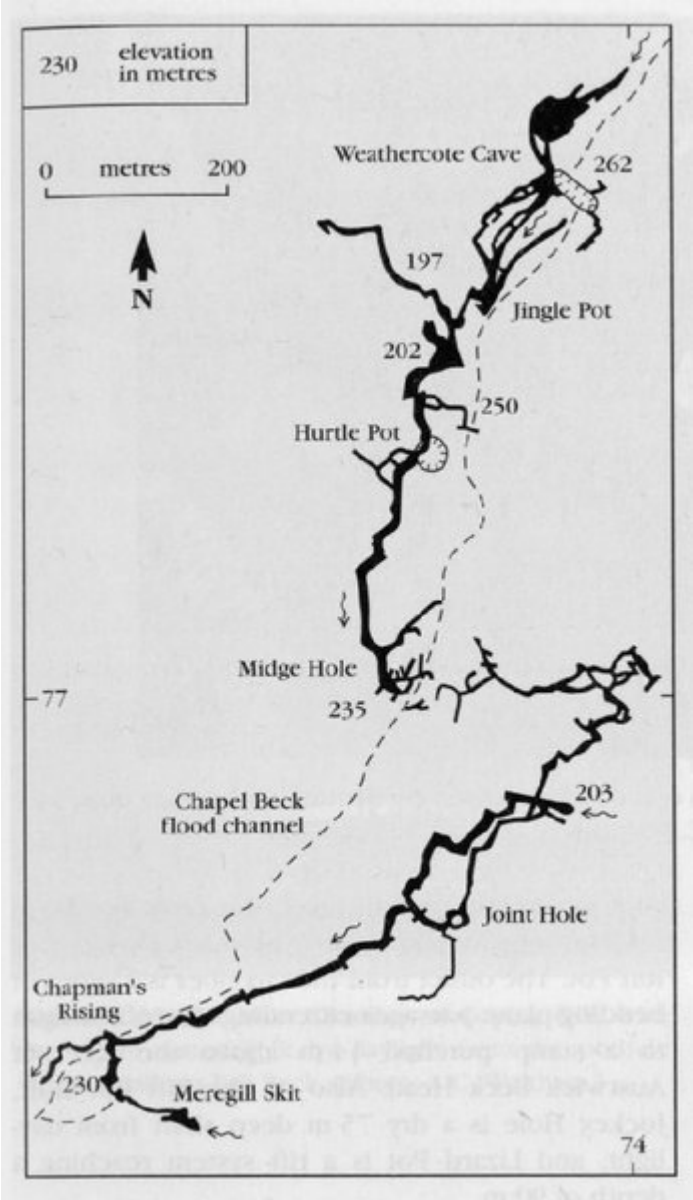


(Figure 2.19) Outline map of White Scar Cave (from survey by Happy Wanderers Cave and Pothole Club).

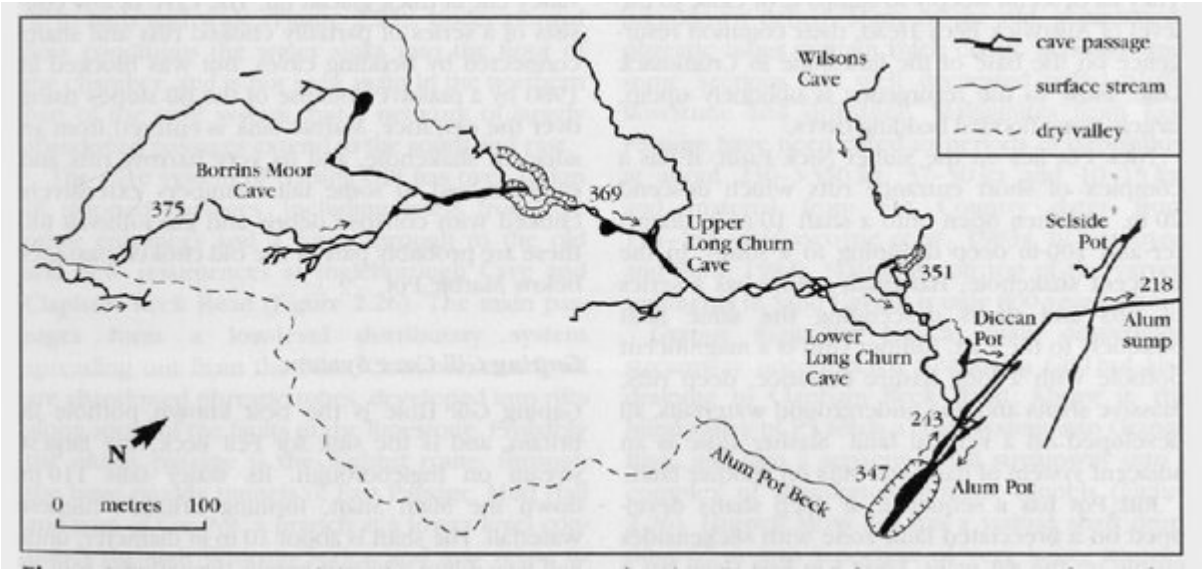
(Figure 2.20) Long calcite straw stalactites in the Far Streamway of White Scar Cave. (Photo: A.C. Waltham.)



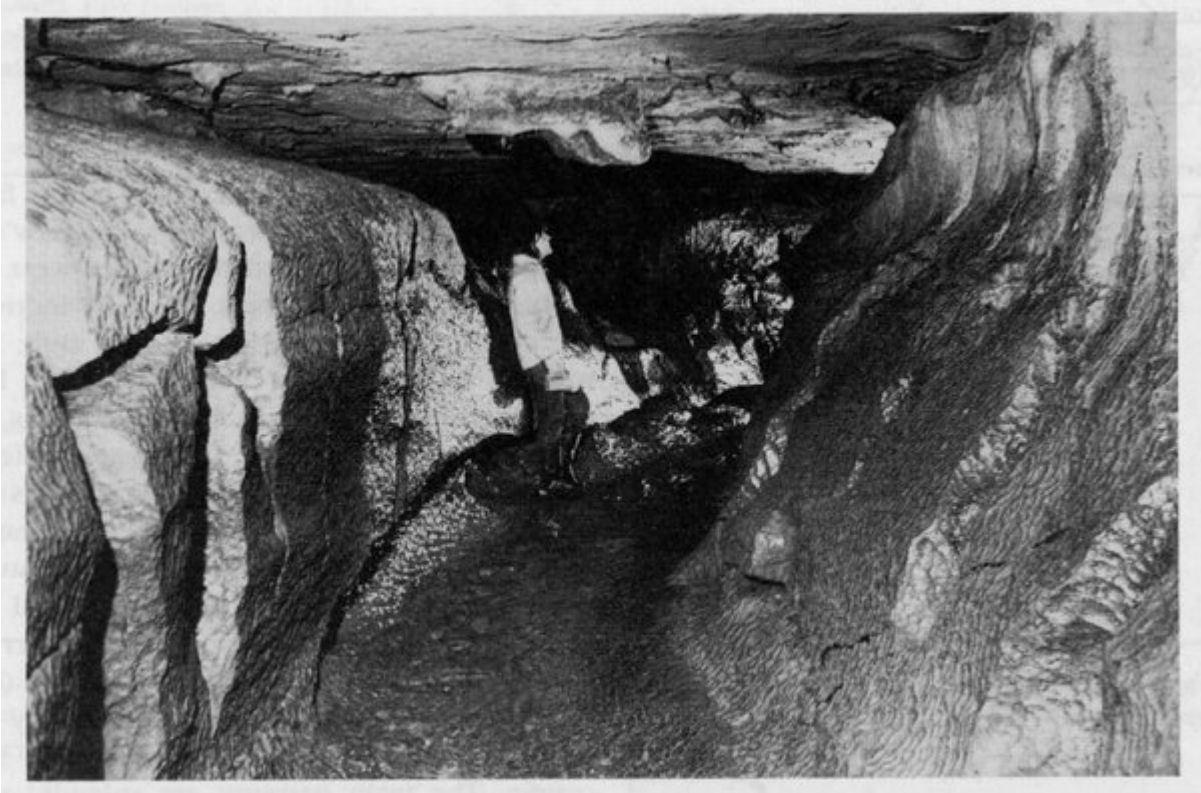
(Figure 2.21) Outline map of the cave systems of Meregill Hole; the flooded passage downstream of Roaring Hole is known to continue for another 300 m. Numbers given refer to elevation in metres (from surveys by University of Leeds Speleological Association).



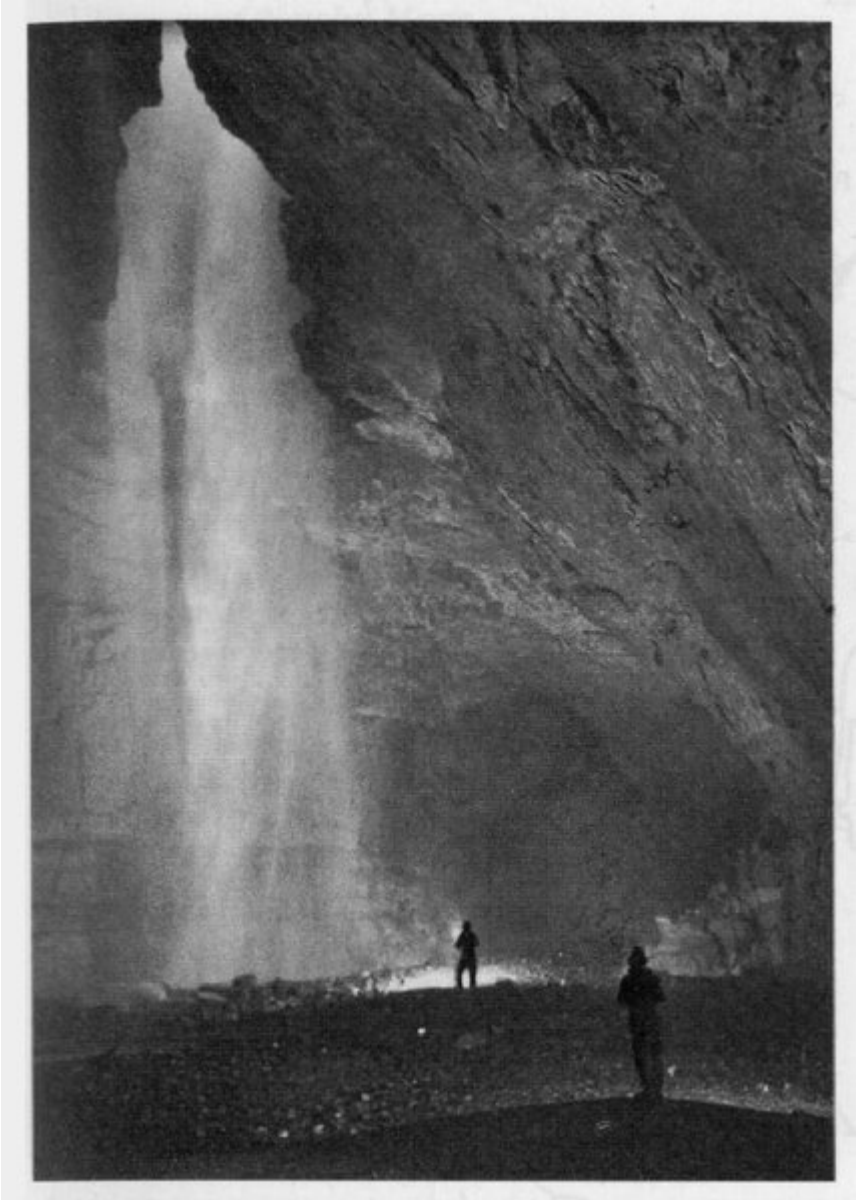
(Figure 2.22) Outline map of the mainly flooded cave passages beneath Chapel Beck (from surveys by Cave Diving Group).



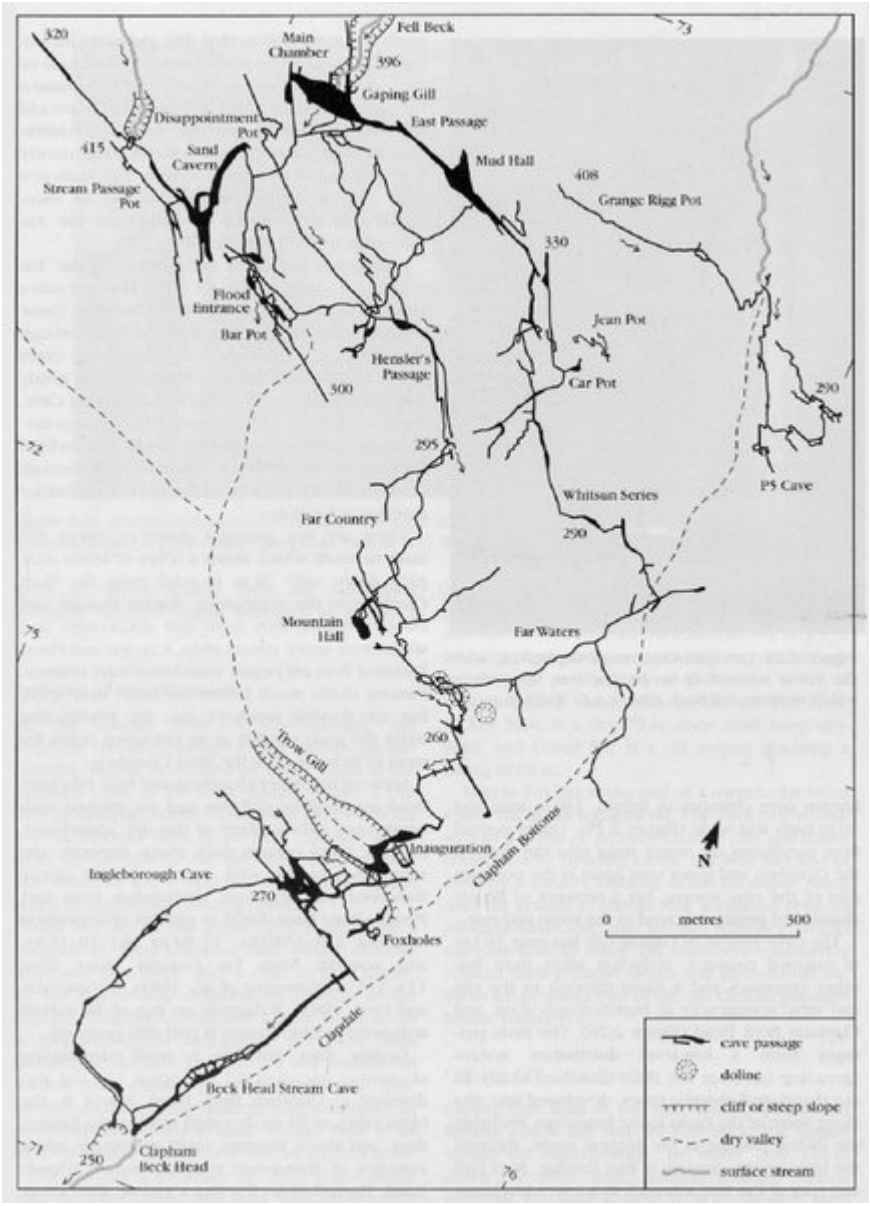
(Figure 2.23) Outline map of the Alum Pot cave system; the Alum Pot sump is known to continue for another 220 m beyond the margin of this map (from survey by University of Leeds Speleological Association).



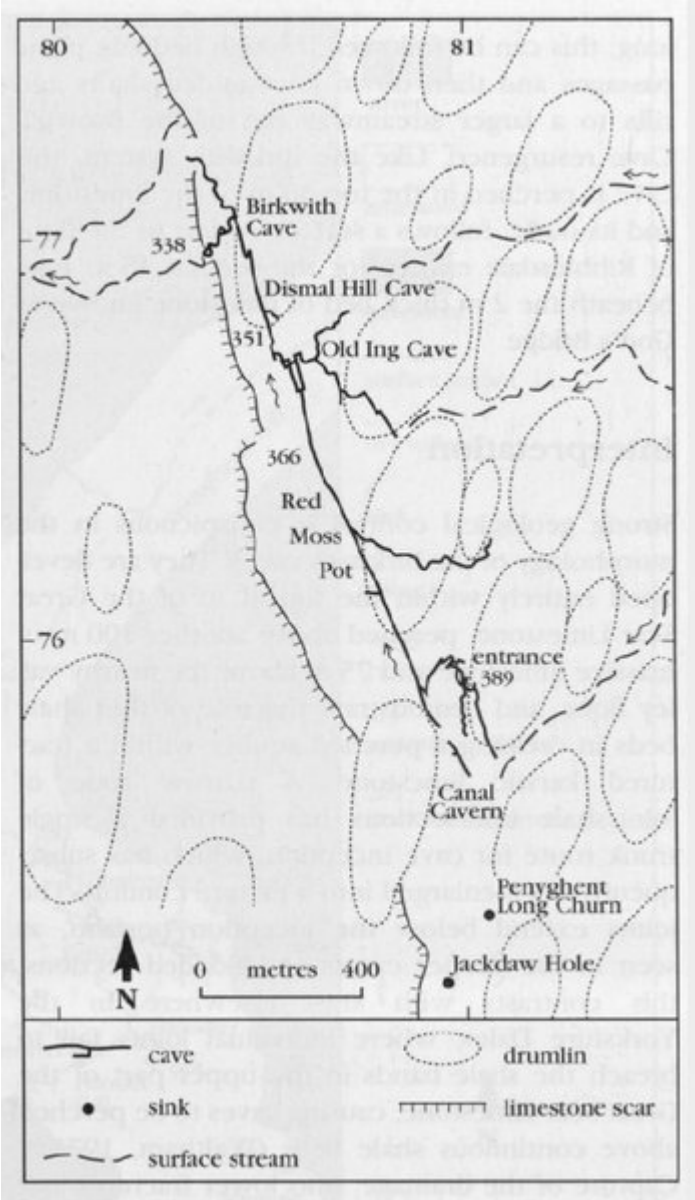
(Figure 2.24) Sharply scalloped limestone forms the walls of the vadose canyon cut beneath the bedding plane roof in the streamway of Upper Long Churn Cave. (Photo: A.C. Waltham.)



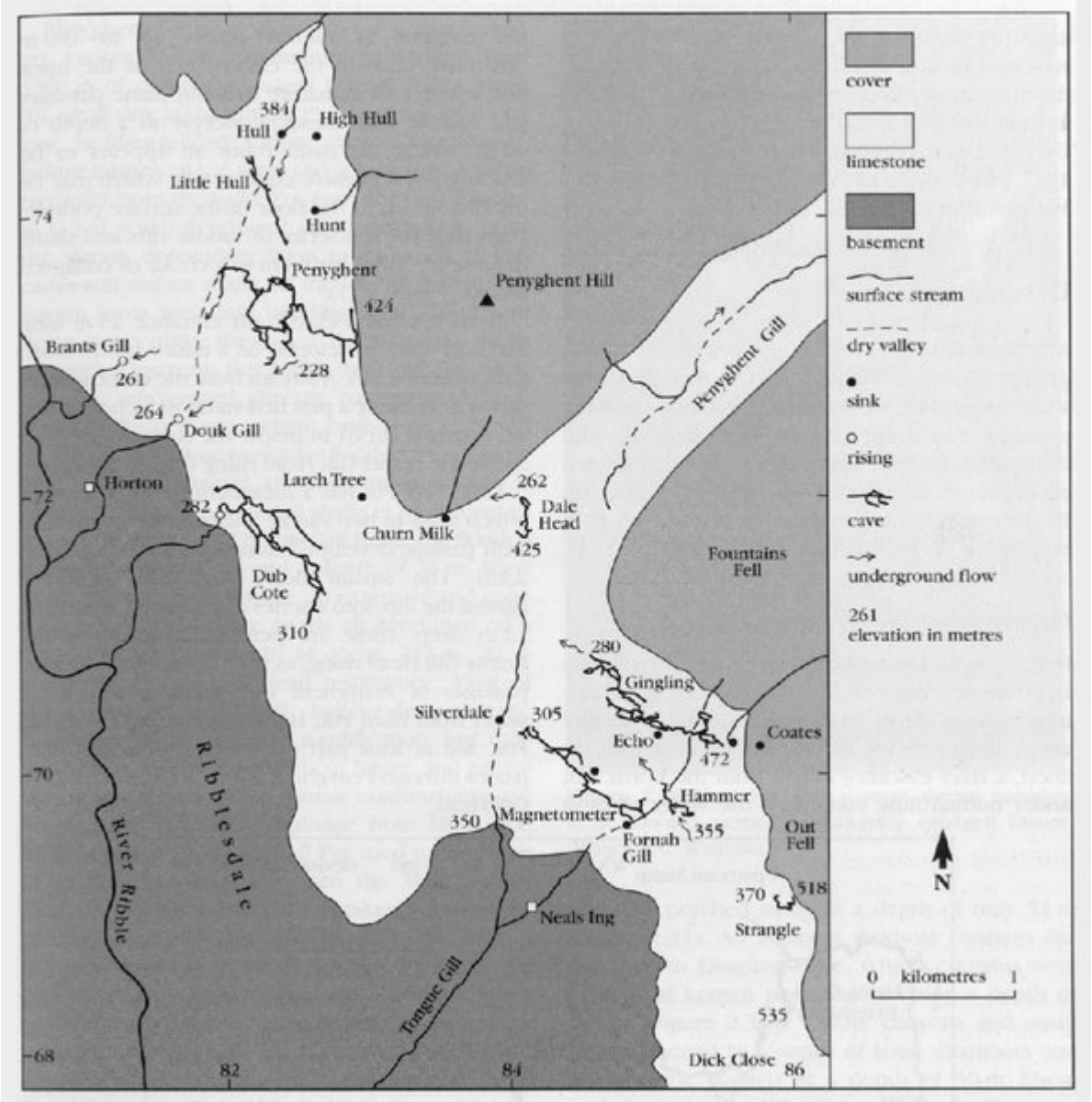
(Figure 2.25) The Main Chamber of Gaping Gill, with the 110 m waterfall lit by daylight from the pothole which swallows Fell Beck. (Photo: A.C. Waltham.)



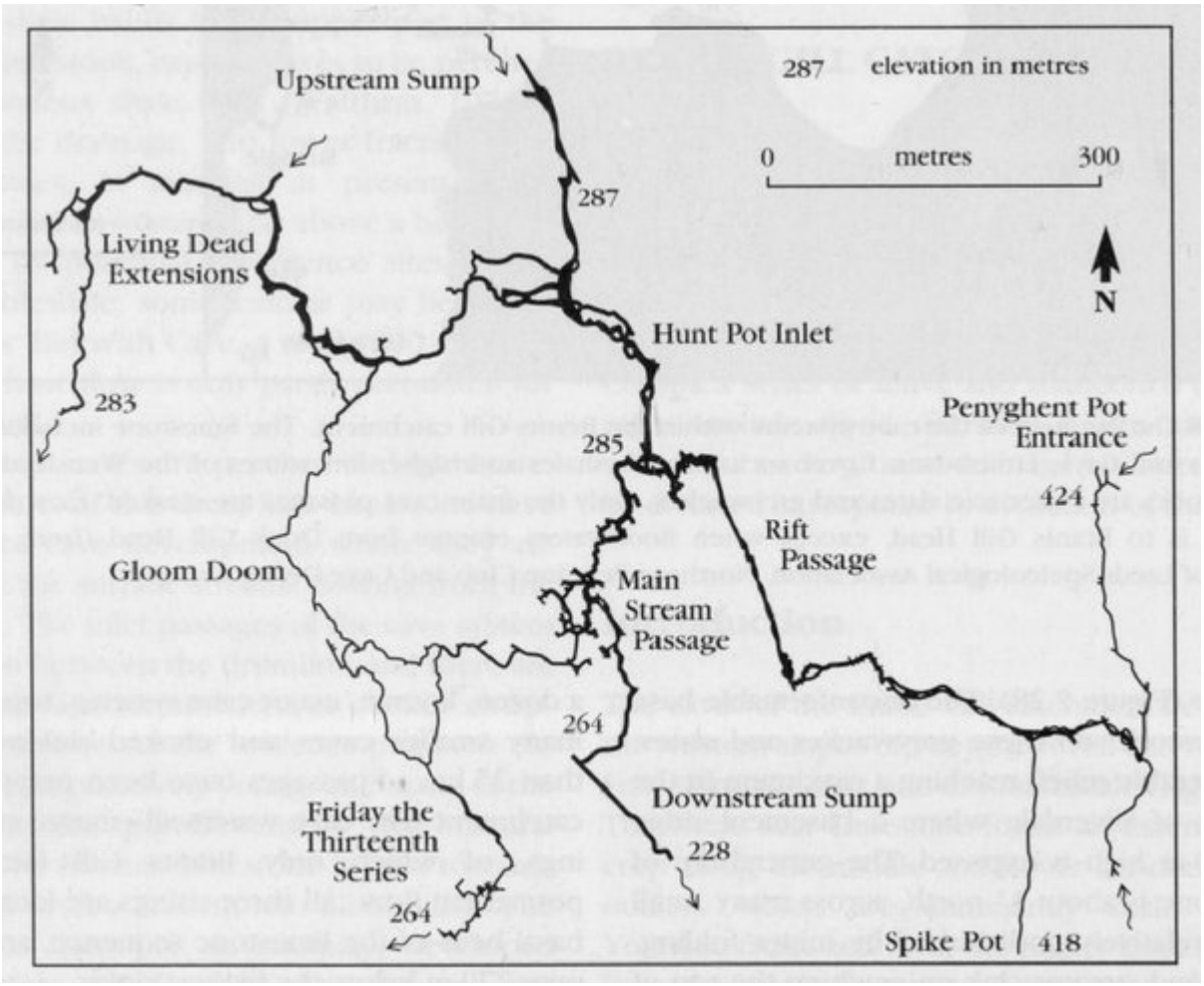
(Figure 2.26) Outline map of the Gaping Gill Cave System, including the passages of Ingleborough Cave and Car Pot. Figures given represent elevation in metres. (From surveys by Bradford Pothole Club and many others.)



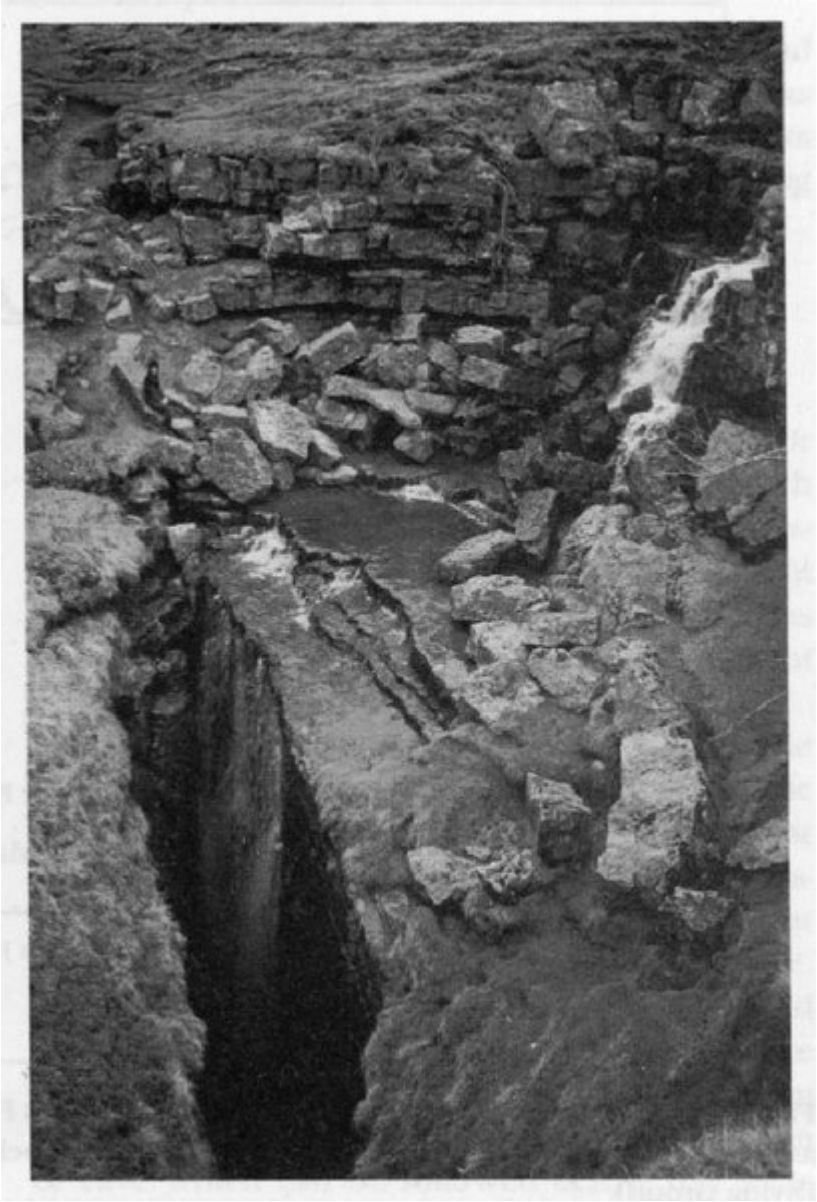
(Figure 2.27) Outline map of the caves of Red Moss and Birkwith, draining the limestone bench beneath part of the Ribblesdale drumlin field. Figures given represent elevation in metres (from surveys by Burnley Caving Club and others).



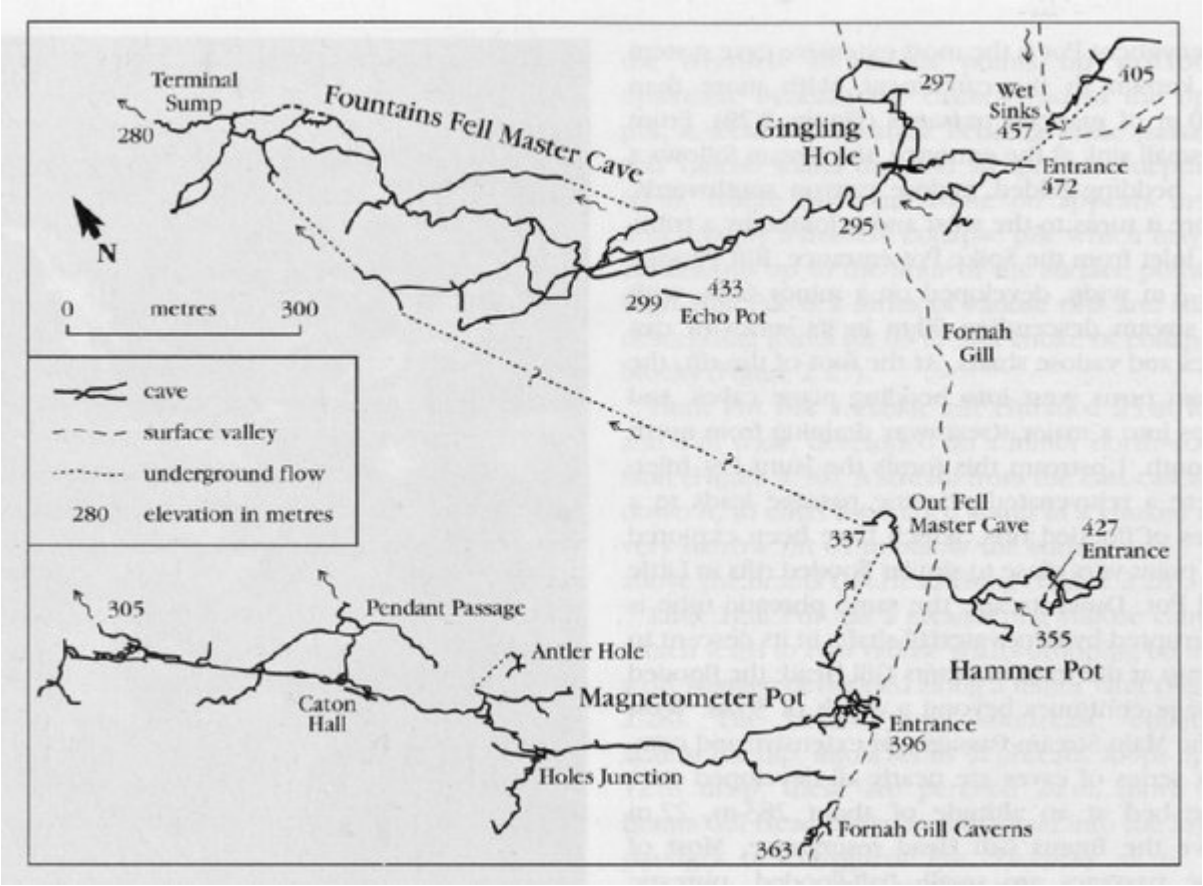
(Figure 2.28) Outline map of the cave systems within the Brants Gill catchment. The limestone includes the Great Scar, Hawes and Gayle Limestones. Cover rocks are the shales and higher limestones of the Wensleydale Group. Basement rocks are Palaeozoic slates and greywackes. Only the main cave passages are marked. Flow from all the main sinks is to Brants Gill Head, except when floodwaters emerge from Douk Gill Head (from surveys by University of Leeds Speleological Association, Northern Pennine Club and Cave Diving Group).



(Figure 2.29) Outline map of the cave passages in Penyghent Pot; the Spike Pot entrance passage is only sketched in (from survey by University of Leeds Speleological Association).

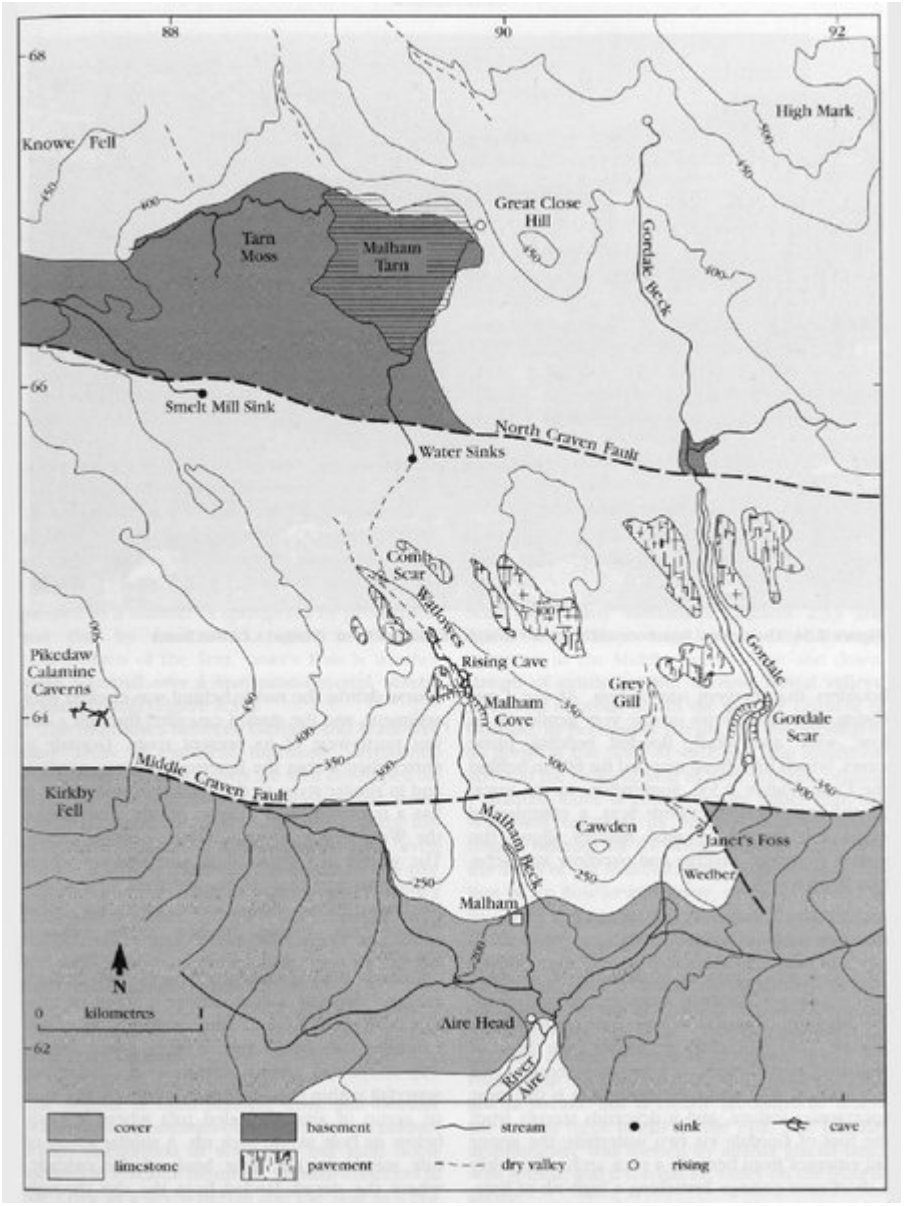


(Figure 2.30) Hunt Pot with a small stream tumbling 27 m down a vertical, solutionally enlarged fissure. (Photo: A.C. Waltham.)

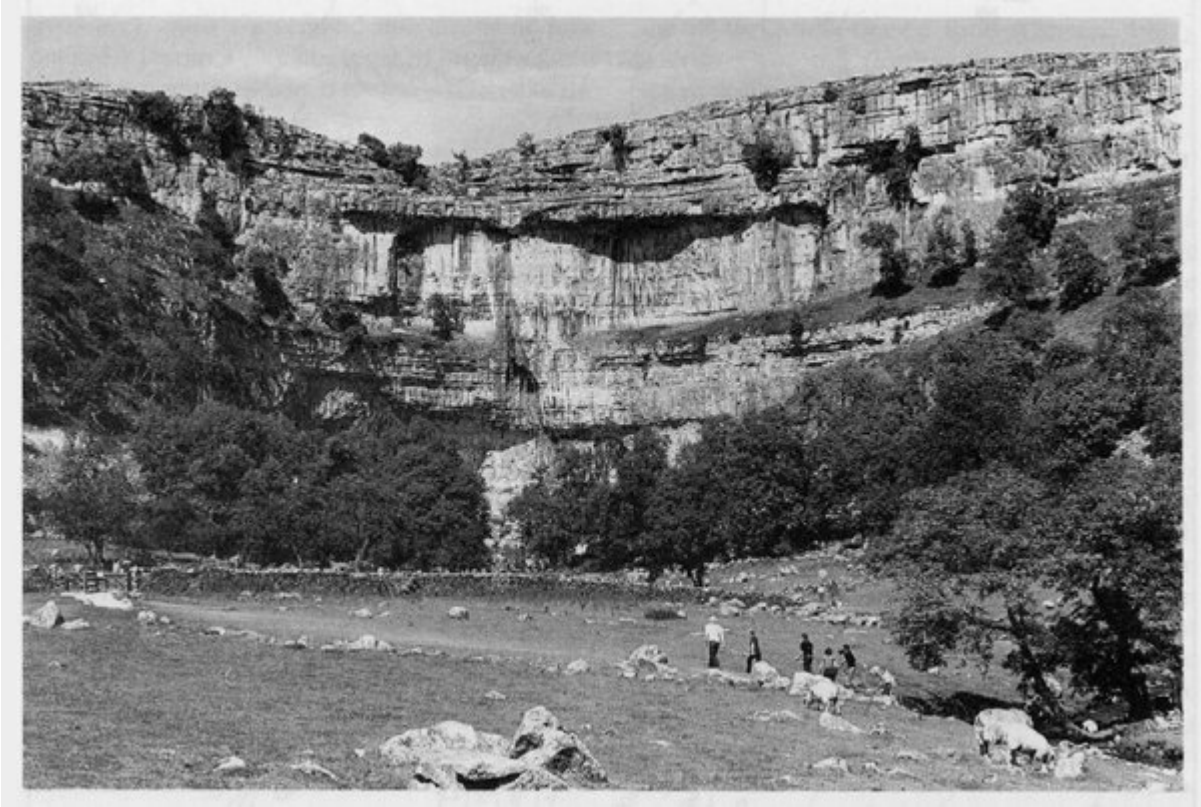


(Figure 2.31) Outline map of the main caves of Fountains Fell; the drainage links into the Fountains Fell Master Cave are not proven (from surveys by University of Leeds Speleological Association, Northern Pennine Club and Cave Diving Group).

(Figure 2.32) Fool's Paradise in Gingling Hole — a beautifully decorated phreatic tube and entrenched vadose canyon. (Photo: J.C. Cunningham.)

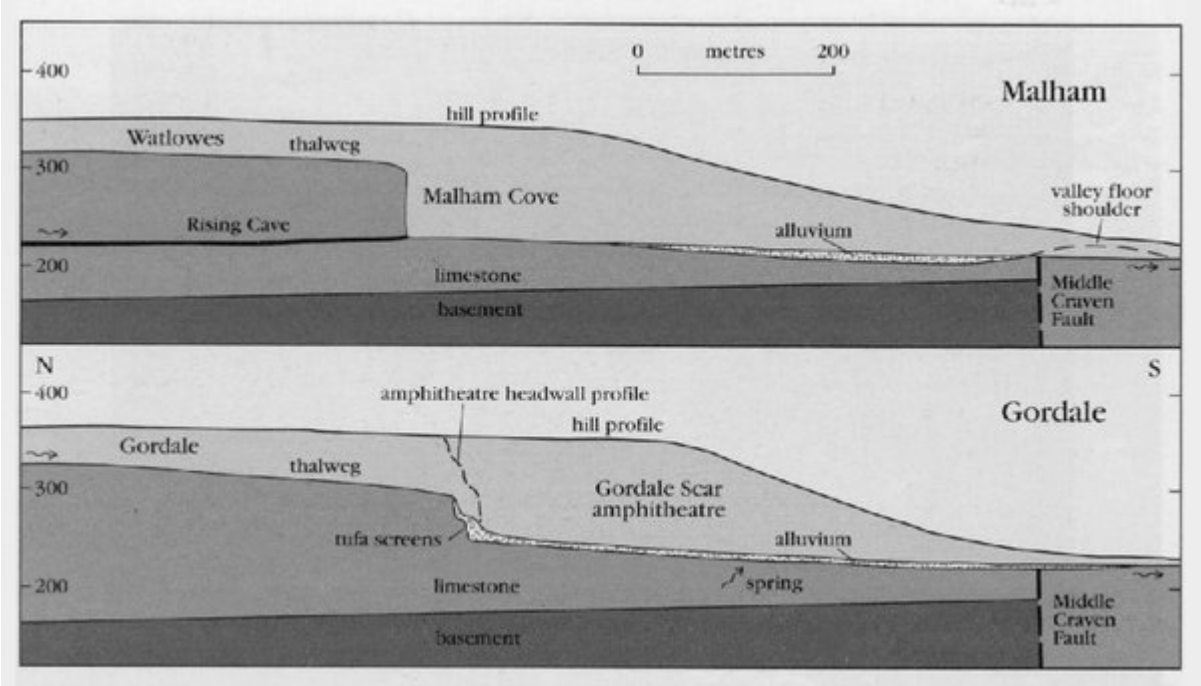


(Figure 2.33) Geological map of the area around Malham Cove and Gordale Scar. The limestone at Aire Head is a thin basinal facies, distinct from the reef and shelf limestones north of Malham village. Cover rocks are Bowland Shales. Basement rocks are Silurian siltstones. There are many minor faults, mostly orientated NW–SE between the North and Middle Craven Faults. Only the main areas of well formed limestone pavement are marked.



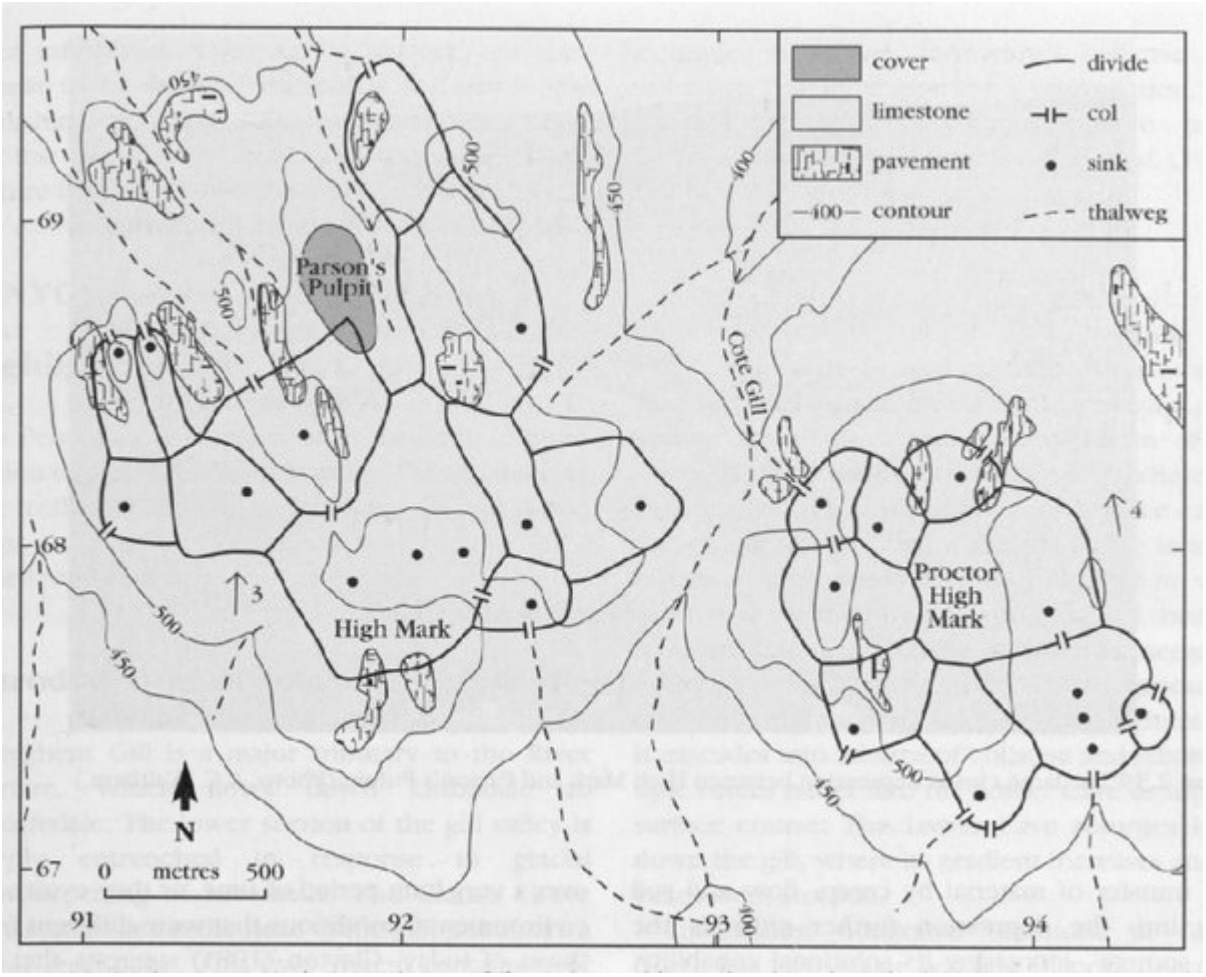
(Figure 2.34) The vertical limestone cliffs, 70–80 m high, of Malham Cove. (Photo: A.C. Waltham.)

(Figure 2.35) The limestone cliffs of Gordale Scar. The tufa waterfalls are lost in the shadows in the meltwater gorge which opens into the glacially excavated amphitheatre. (Photo: A.C. Waltham.)

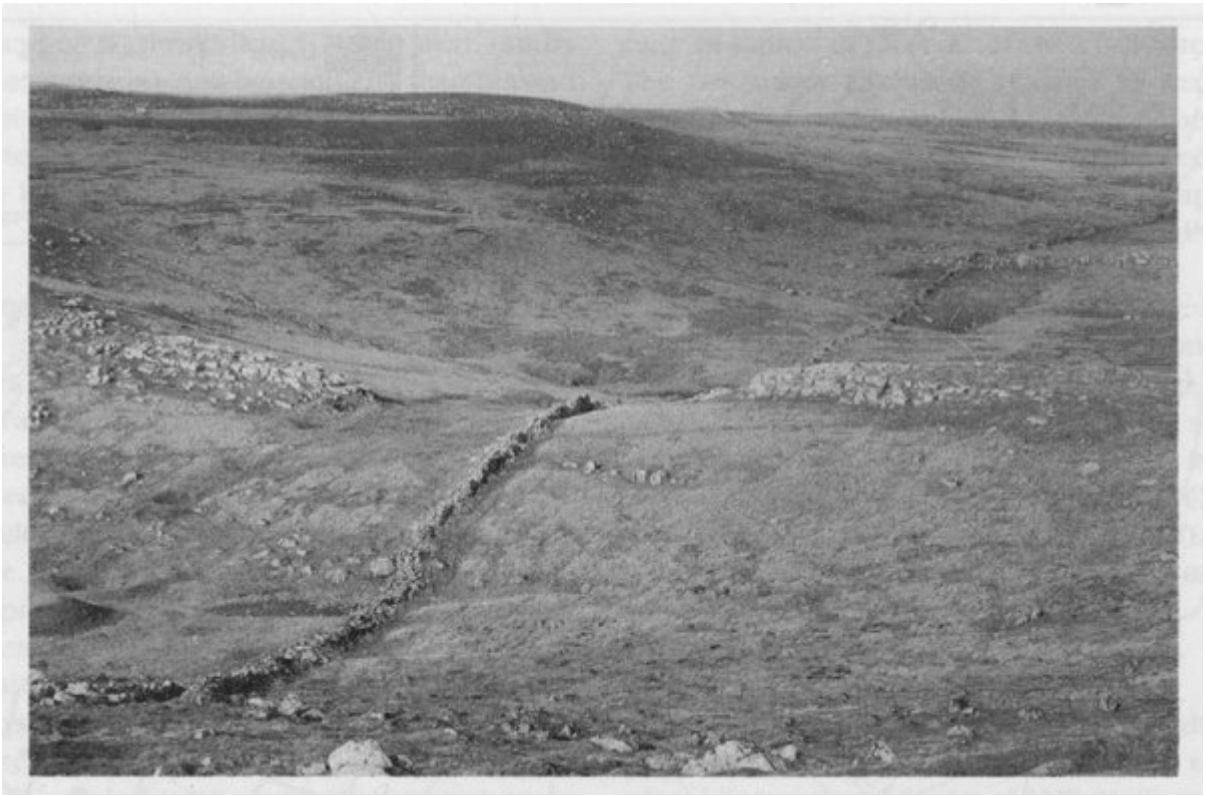


(Figure 2.36) Long profiles through Malham Cove and Gordale Scar showing the prominent thalweg steps which have retreated from the Middle Craven Fault scarp.

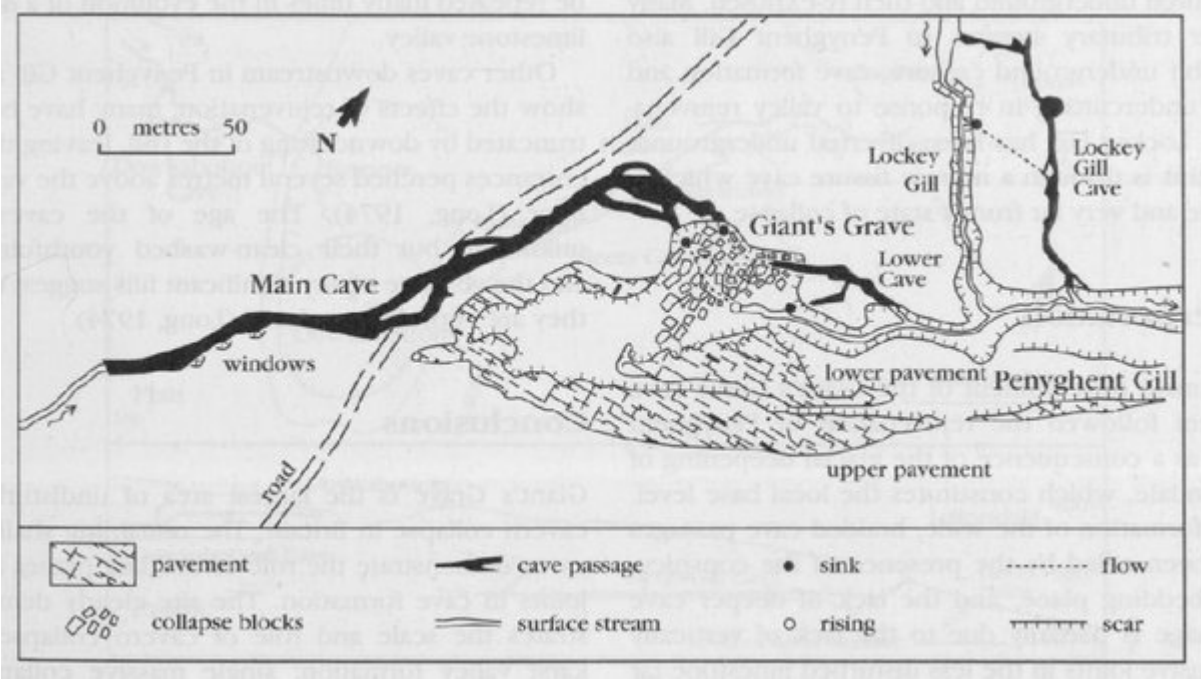
(Figure 2.37) Watlowes, the dry valley excavated by meltwater which leads down to the top of Malham Cove. (Photo: A.C. Waltham.)



(Figure 2.38) Outline geomorphological map of the polygonal karst developed on the limestone crests around High Mark.

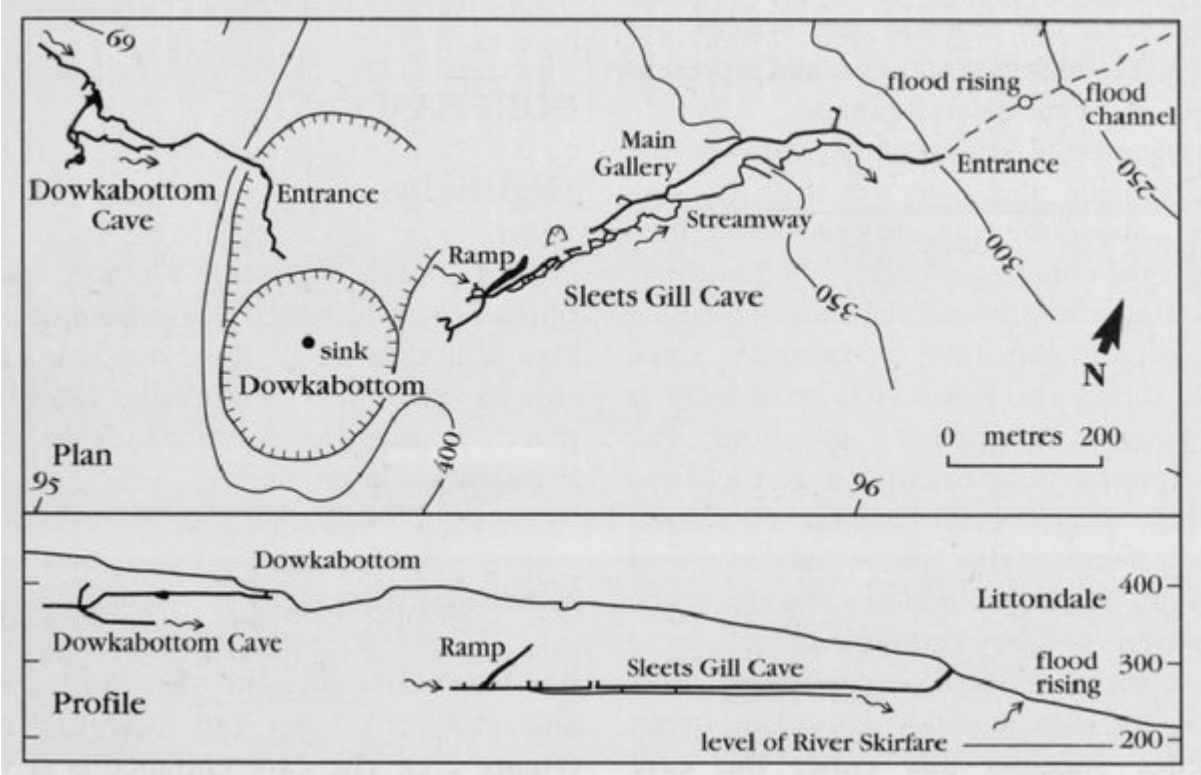


(Figure 2.39) The large closed depression between High Mark and Parson's Pulpit. (Photo: A.C. Waltham.)

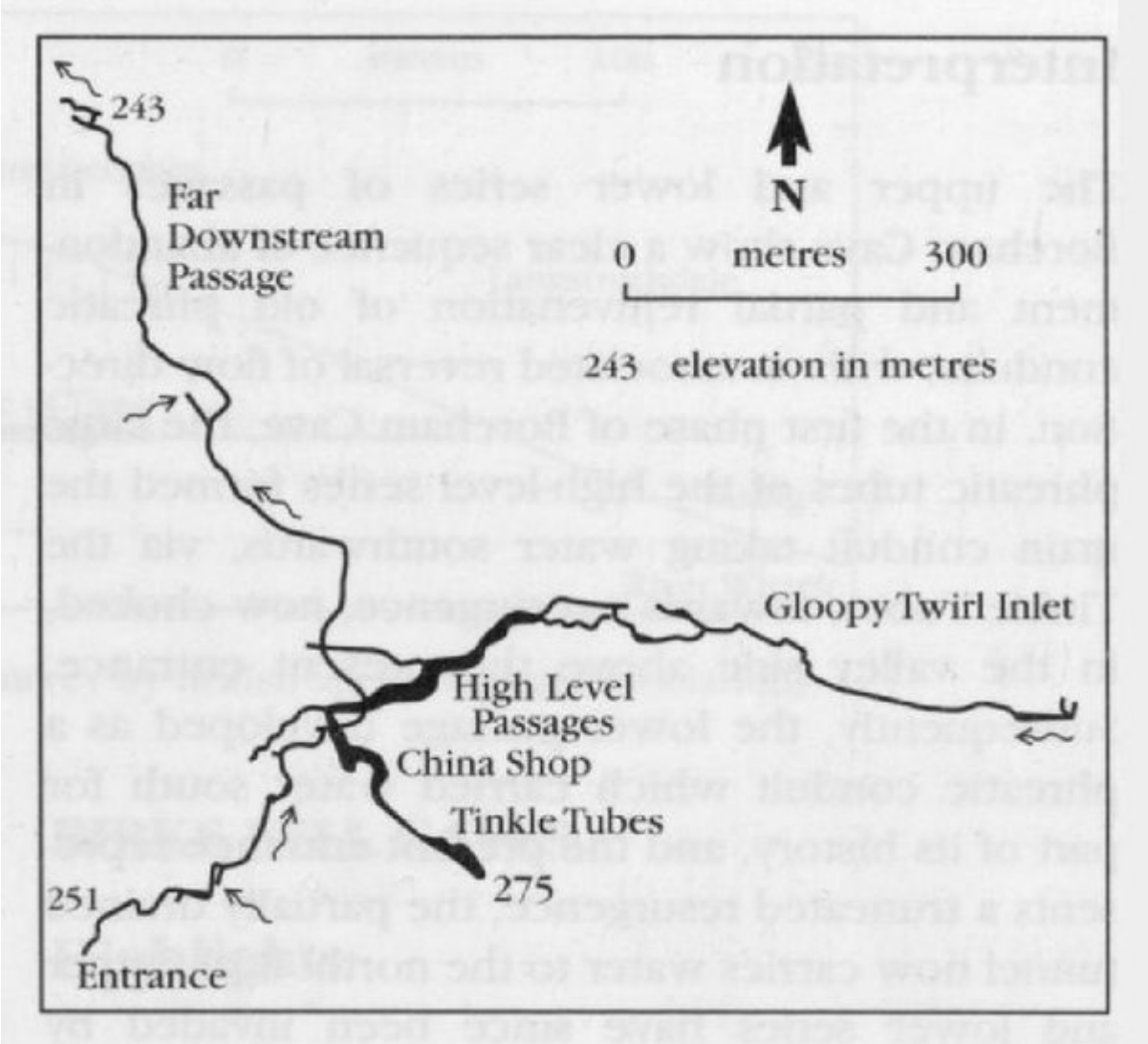


(Figure 2.40) Geomorphological map of the collapse area and associated caves at Giant's Grave at the head of Penyghent Gill.

(Figure 2.41) The foundered blocks of limestone in the collapse area at Giant's Grave, Penyghent Gill. (Photo: A.C. Waltham.)

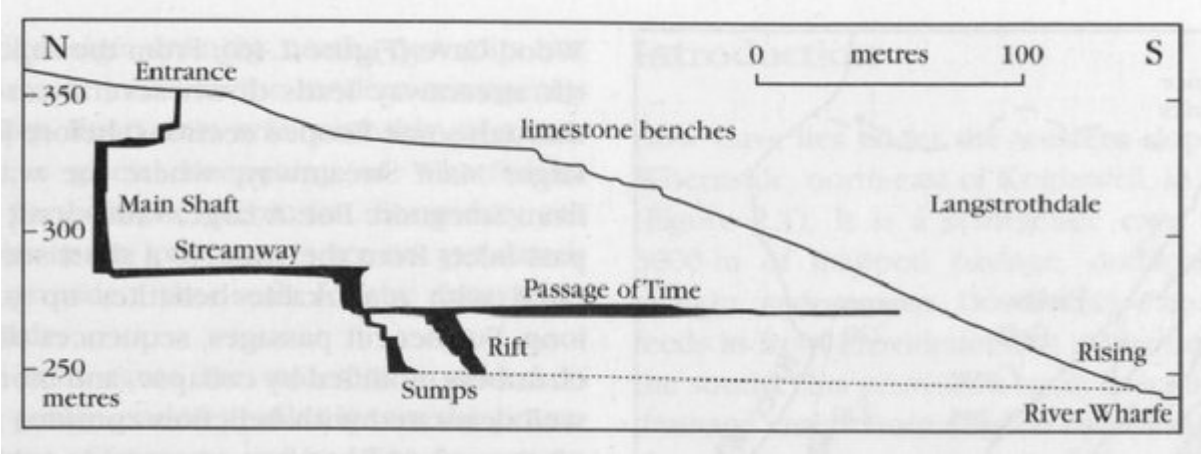


(Figure 2.42) Outline map and profile of Sleets Gill Cave and its associated karstic features (from surveys by University of Leeds Speleological Association and others).

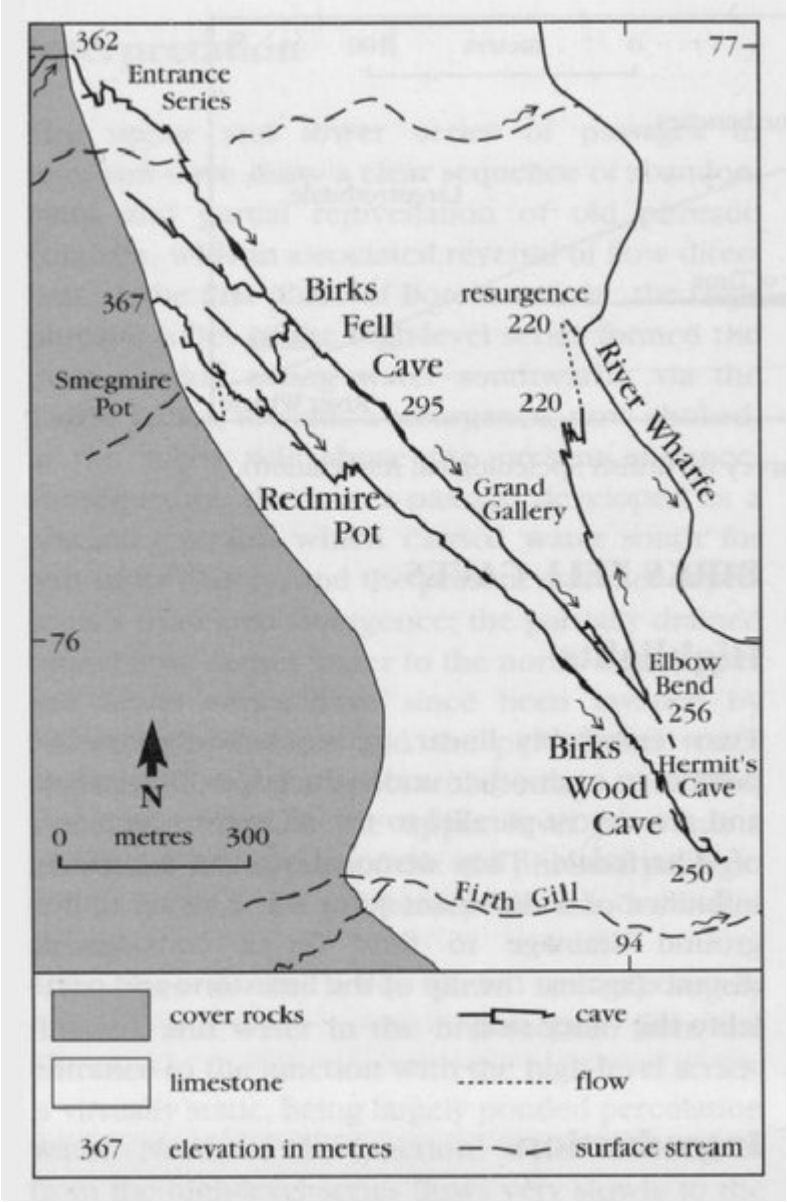


(Figure 2.43) Outline map of Boreham Cave (from survey by Cave Diving Group).

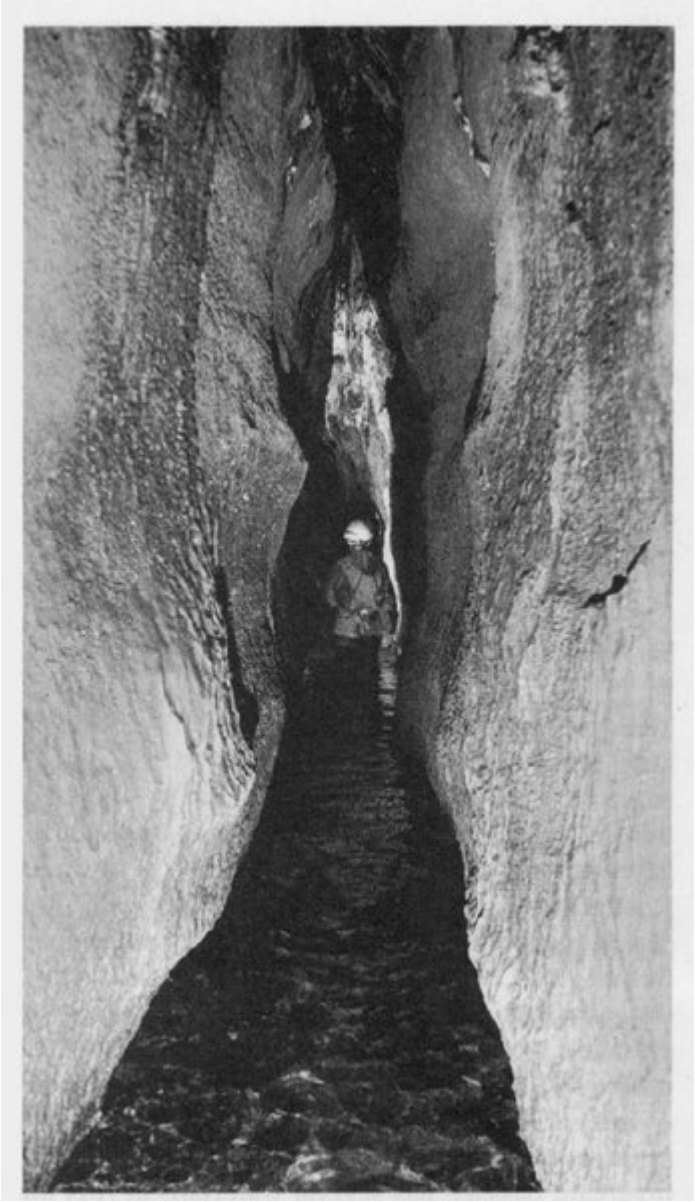
(Figure 2.44) Delicate straw stalactites hang down into standing water in the old phreatic tube of the China Shop in Boreham Cave. (Photo: T.G. Yeadon.)



(Figure 2.45) Long section through Strans Gill Pot (from survey by British Speleological Association).

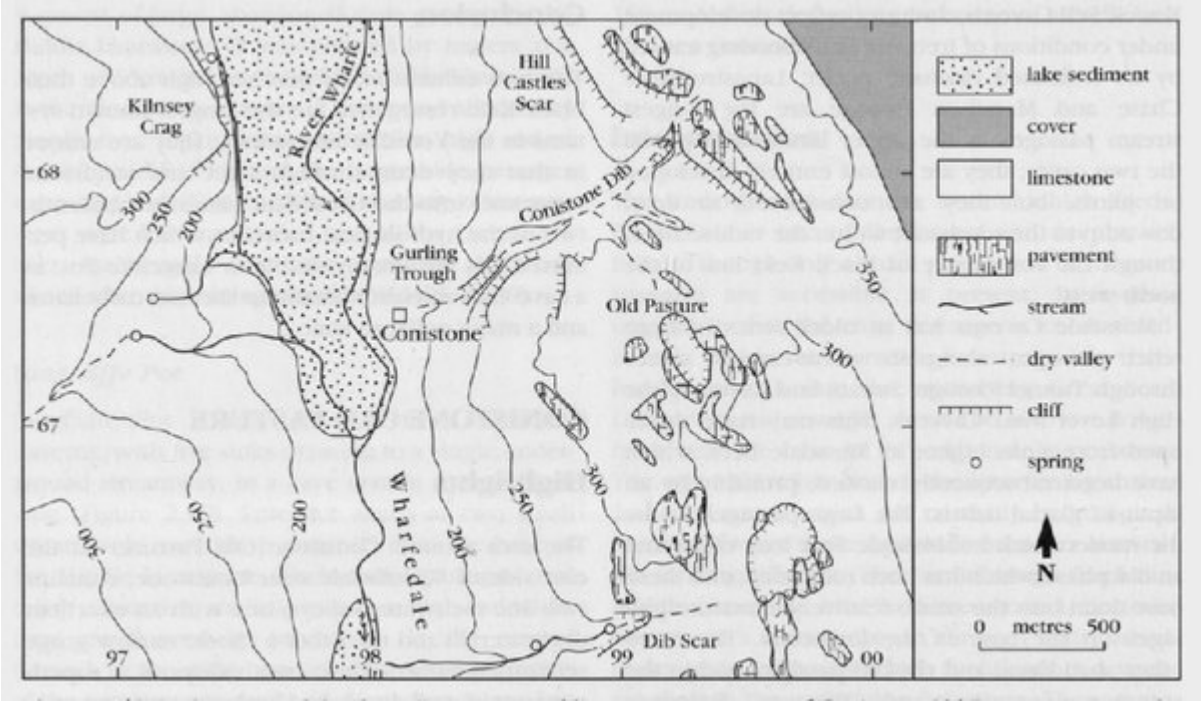


(Figure 2.46) Outline map of the Birks Fell and Birks Wood Caves (from surveys by Craven Pothole Club and Cambridge University Caving Club).



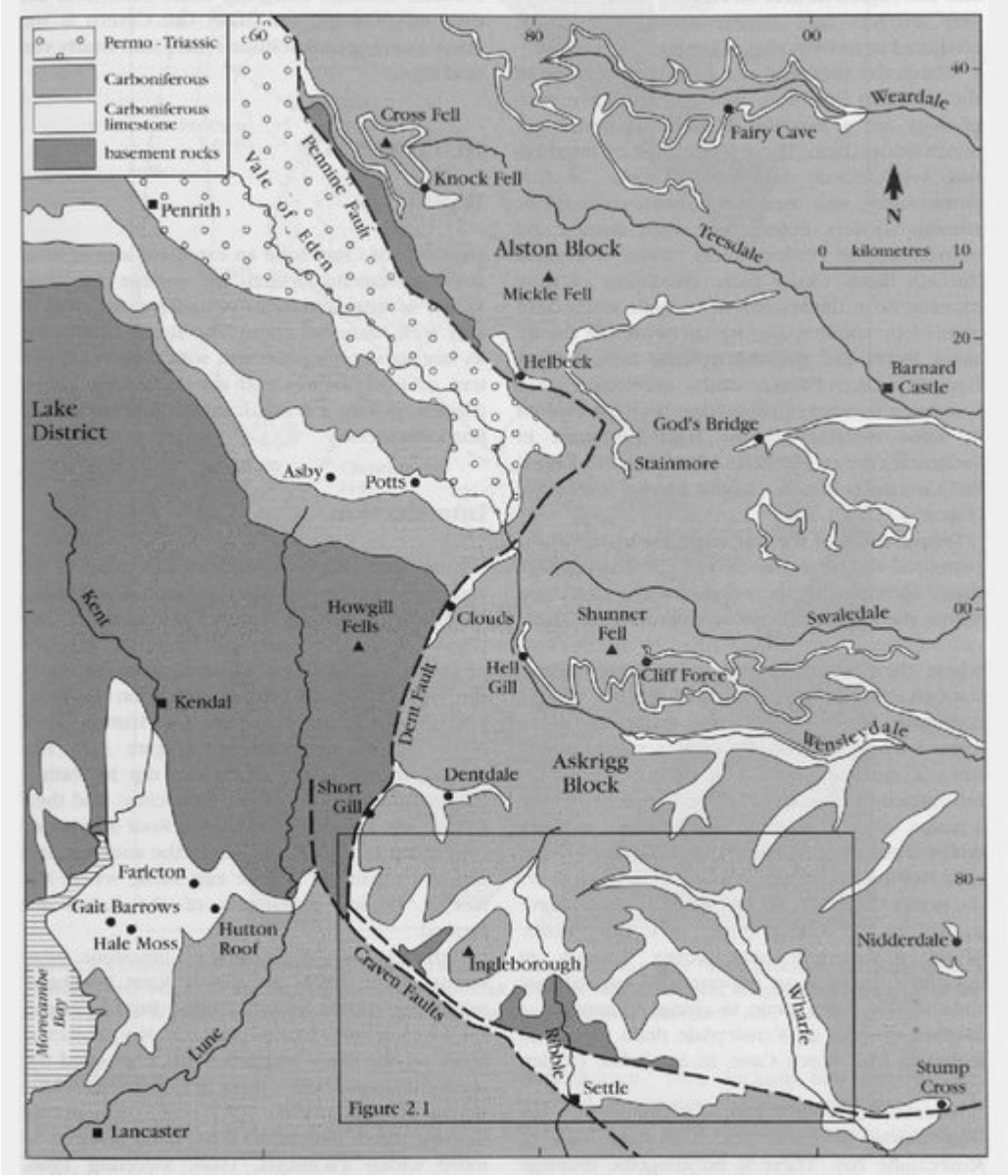
(Figure 2.47) The tall, narrow rift of Dowber Gill Passage in Dow Cave (Photo: M.H. Long.)

(Figure 2.48) Outline map of Mossdale Caverns and Langcliffe Pot, which both drain to Black Keld. The limestone includes the Great Scar Limestone and the Yoredale facies limestones of the overlying Brigantian Wensleydale Group; the latter are separated by thin shales and sandstones that are not marked (from surveys by University of Leeds Speleological Association and others).

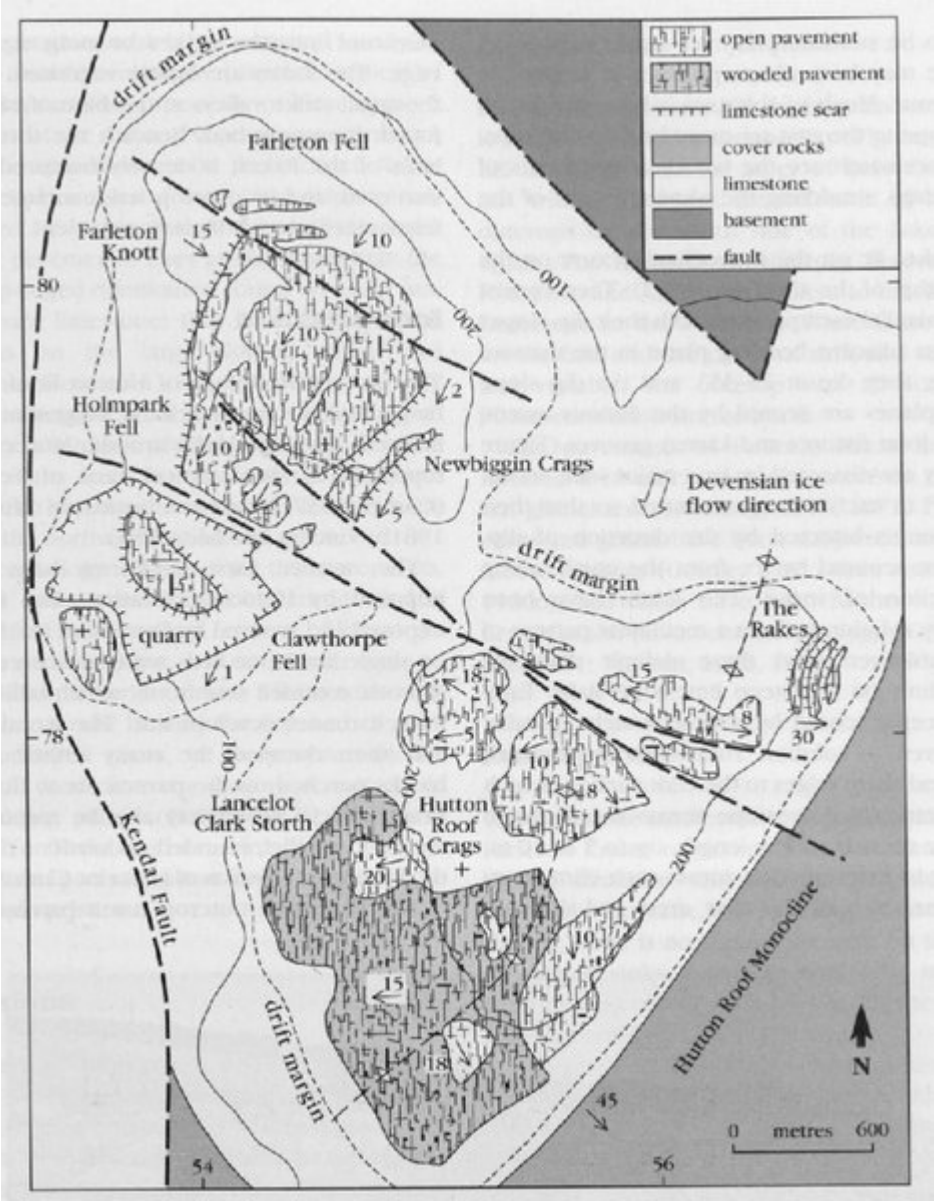


(Figure 2.49) Outline map of the dry valleys, scars and limestone pavements of Conistone Old Pasture. Cover rocks are the shales and limestones of the Yoredale facies, above the Great Scar Limestone.

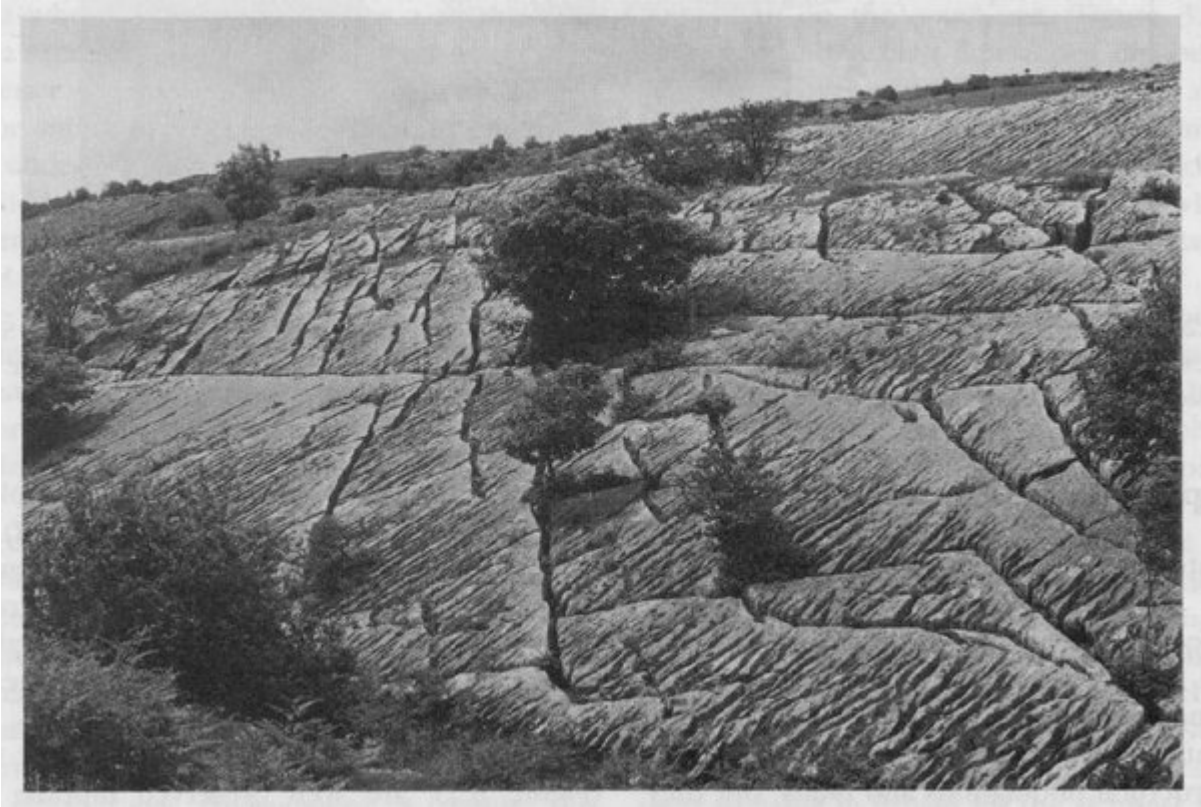
(Figure 2.50) The dry valley of Conistone Dib, seen from the limestone scars with Wharfedale in the distance. (Photo: A.C. Waltham.)



(Figure 3.1) Outline map of the karst regions in the northern Pennines, with locations referred to in the text. The other Carboniferous rocks are the non-carbonates of the Orton Group and Yoredale facies of the Dinantian, and the Namurian, but they include thin bands of limestone with lesser karst features not shown on this map. The Carboniferous limestone includes the Dinantian Great Scar Limestone, the Yoredale limestones with significant karst, and the Main or Great Limestone of Namurian age. The basement rocks are Lower Palaeozoic non-carbonates. Details and locations in the southern Dales are shown in (Figure 2.1).

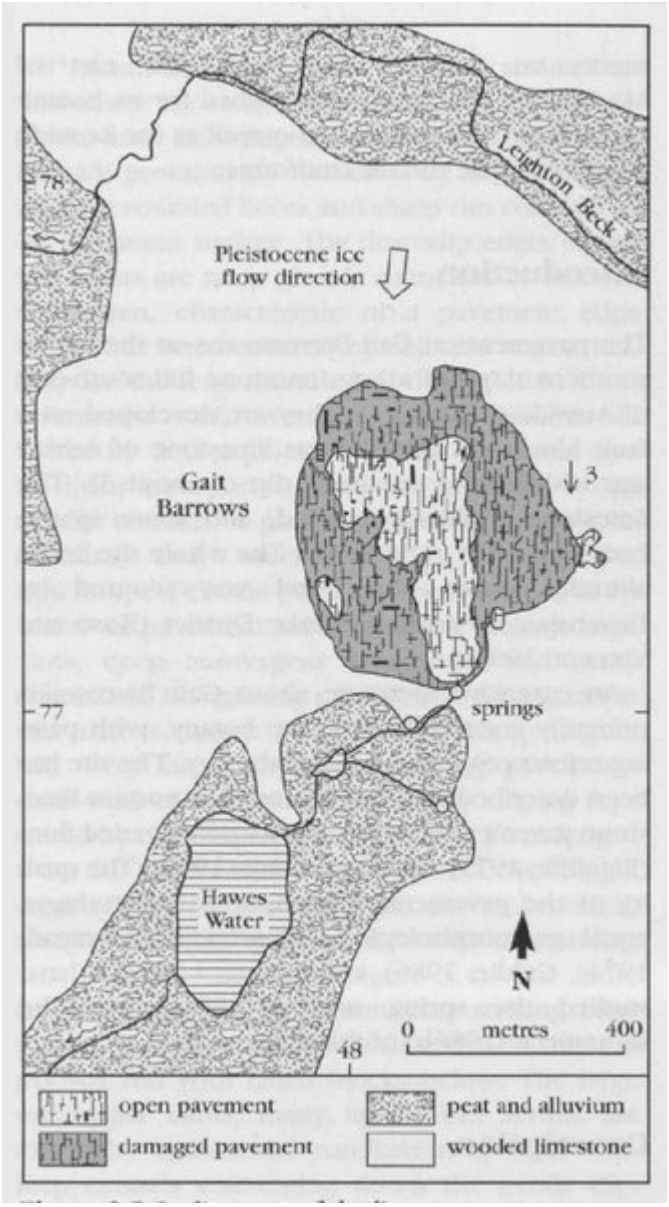


(Figure 3.2) Outline map of the limestone hills of Farleton Knott and Hutton Roof Crags. Basement rocks are Silurian mudstones. Cover rocks are the Brigantian and Namurian Bowland Series. The drift margin marks the edge of the thicker glacial till which covers most of the lowland around the limestone hills (partly after Moseley, 1972).,

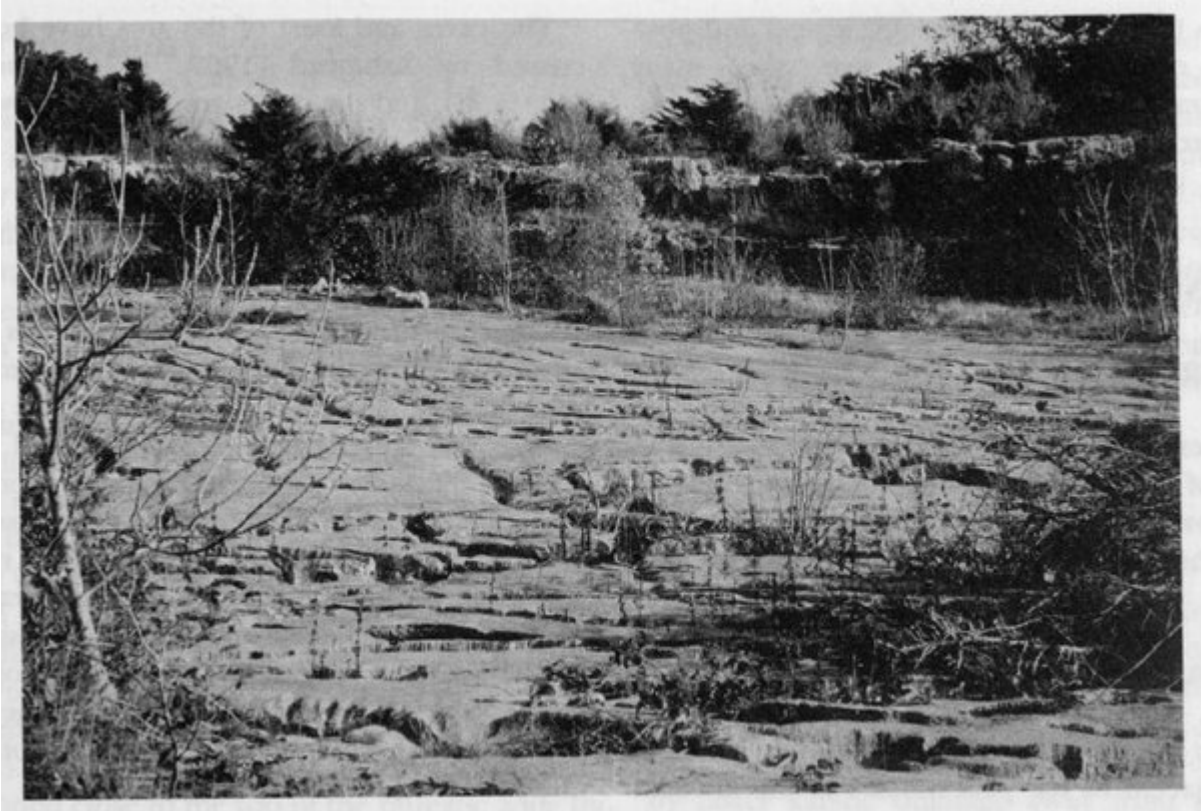


(Figure 3.3) The distinctive inclined limestone pavements of the Rakes above Hutton Roof, with the deep rinnenkarren raking down the diamond-shaped slabs between the joint-guided kluftkarren. (Photo: A.C. Waltham.)

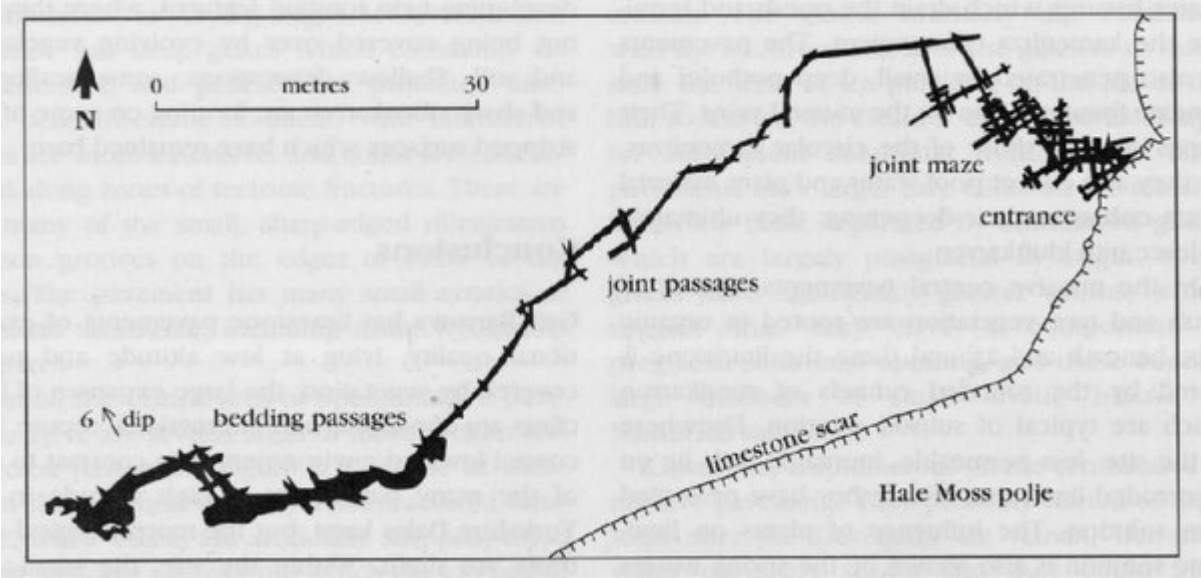
(Figure 3.4) The excellent pavements with square clints deeply scored by rundkarren on Newbiggin Crags. (Photo: A.C. Waltham.)



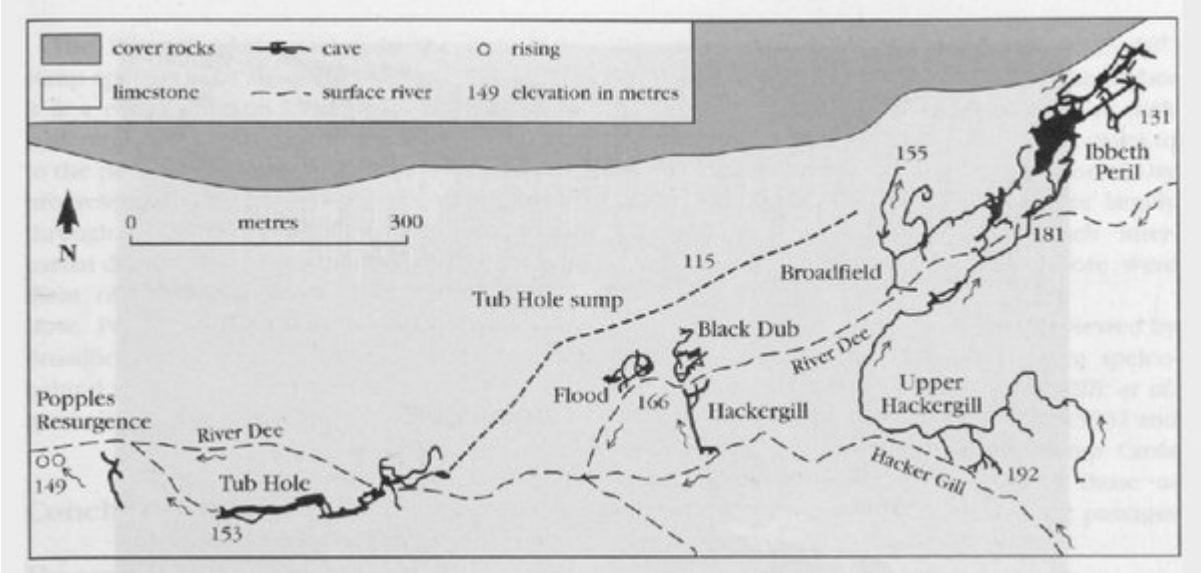
(Figure 3.5) Outline map of the limestone pavements on Gait Barrows.



(Figure 3.6) The very large clints in the central open pavements on Gait Barrows. (Photo: A.C. Waltham.)

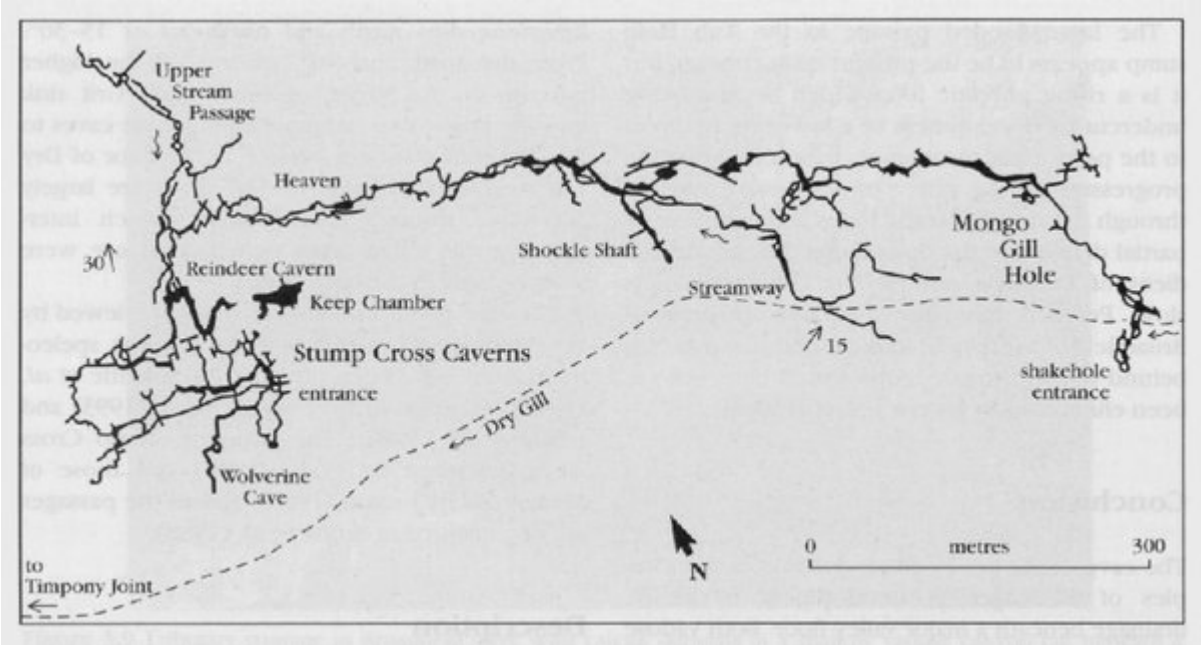


(Figure 3.7) Outline map of Hale Moss Cave (from survey by Red Rose Cave and Pothole Club).

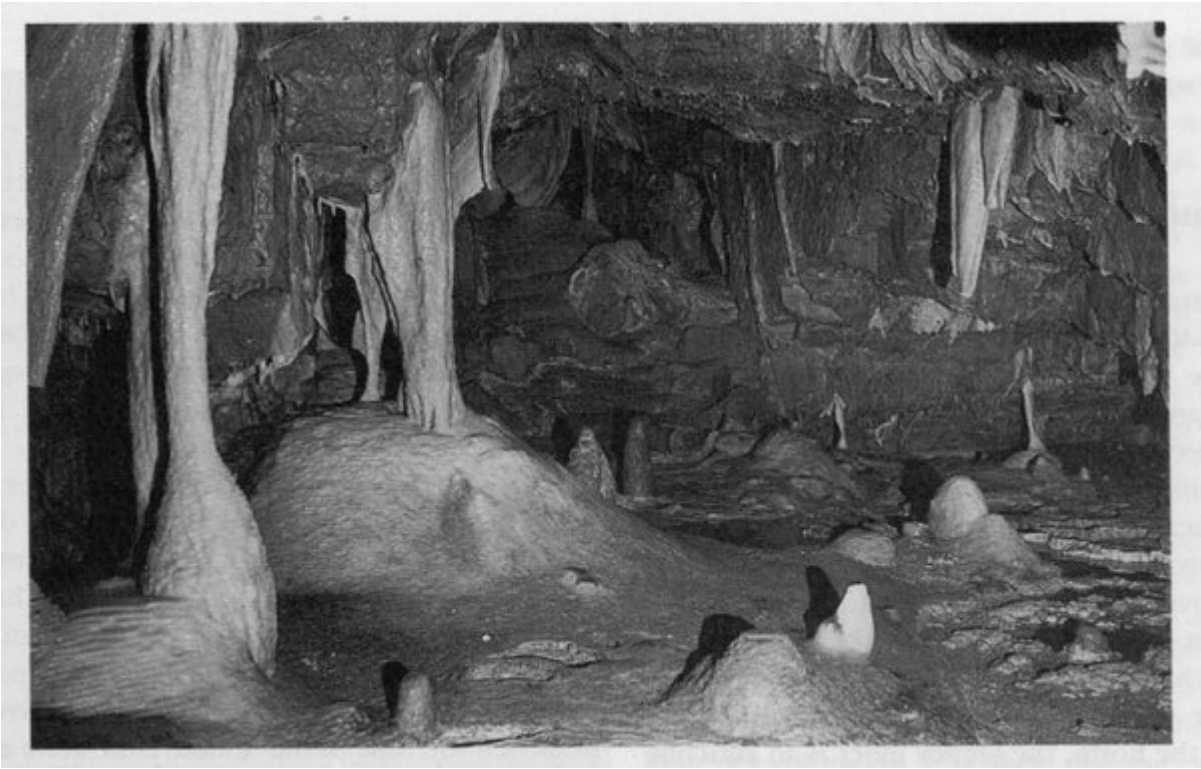


(Figure 3.8) Outline map of the caves of Upper Dentdale. The line of the flooded section in the upstream sump of Tub Hole is only approximate (from surveys by Kendal Caving Club, British Speleological Association, Cave Diving Group and others).

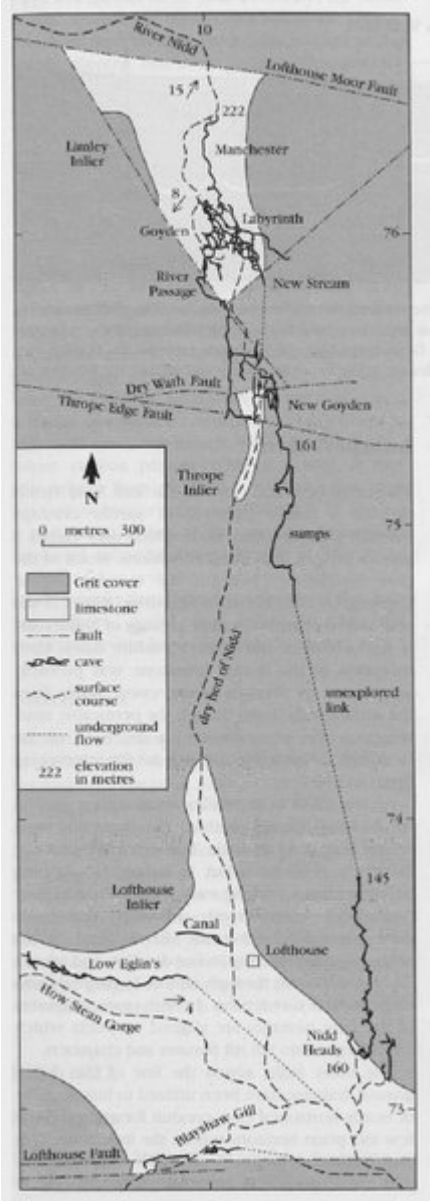
(Figure 3.9) Tributary passage in Broadfield Cave with calcite deposits in a shallow vadose canyon cut beneath a bedding plane. (Photo: M.H. Long.)



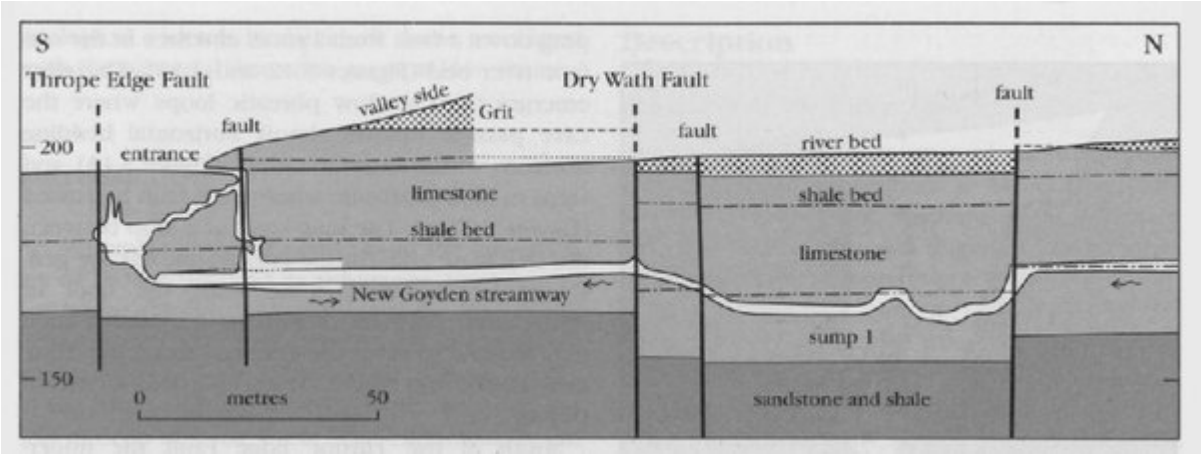
(Figure 3.10) Outline map of the cave passages in Stump Cross Caverns and Mongo Gill Hole (from survey by Craven Pothole Club).



(Figure 3.11) Thick flowstone deposits in a suite dated to 83 000 ka in the Wolverine Cave in Stump Cross Caverns. (Photo: A.C. Waltham.)

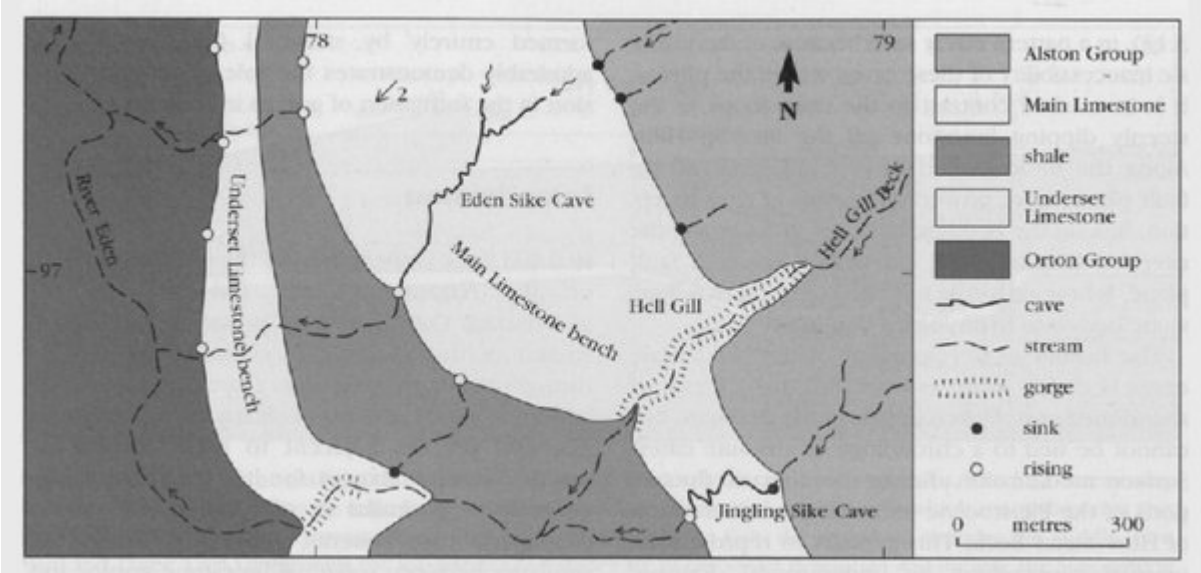


(Figure 3.12) Geological map of the caves in the upper part of Nidderdale. Limestone includes the Middle, Five Yard and Three Yard Limestones. Grit cover is the Grassington Grit and some overlying Namurian beds on the higher slopes. Eglin's Cave extends off the map to the west. (Outcrop geology after Wilson, 1983; cave surveys from Yorkshire Underground Research Team, Cave Diving Group and others.)

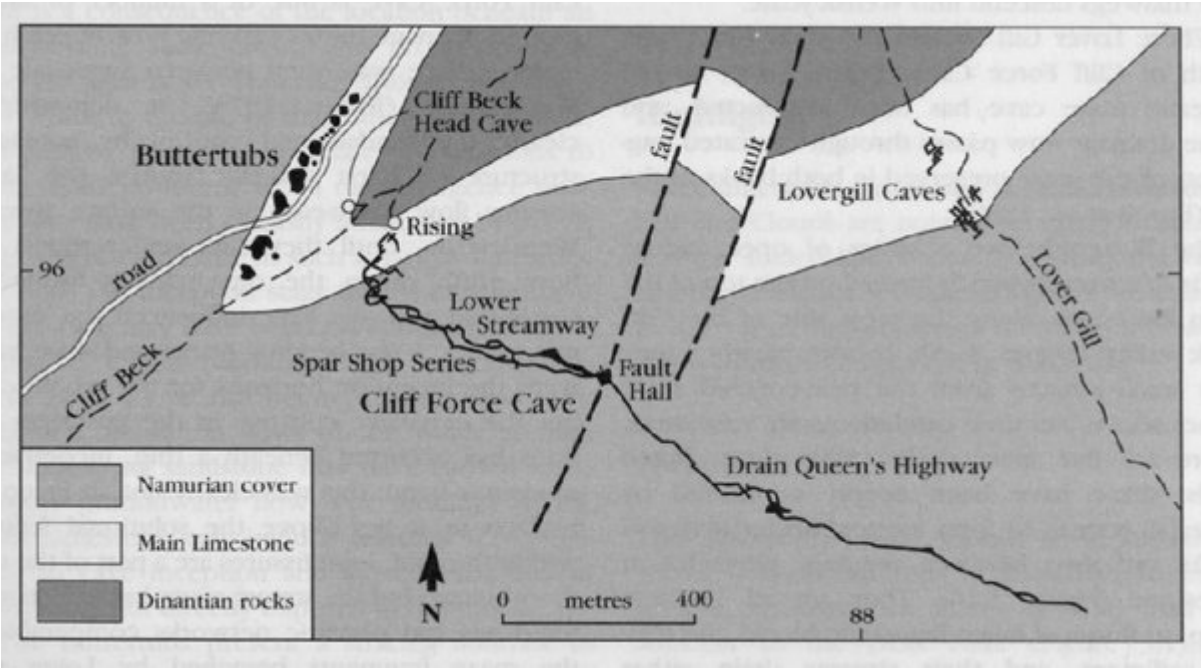


(Figure 3.13) Profile of the geology and cave passages in the western part of New Goyden Pot. The main streamway flows south towards the Thrope Edge Fault, and then turns into a loop back to the north which is not shown in this profile downstream of the entrance shaft. The grit is the Grassington Grit; the limestone includes the Middle, Five Yard and Three Yard Limestones; the sandstones and shales are of the lower Brigantian and include the Simonstone Limestone at

an unknown depth. (After Davies, 1974b.)

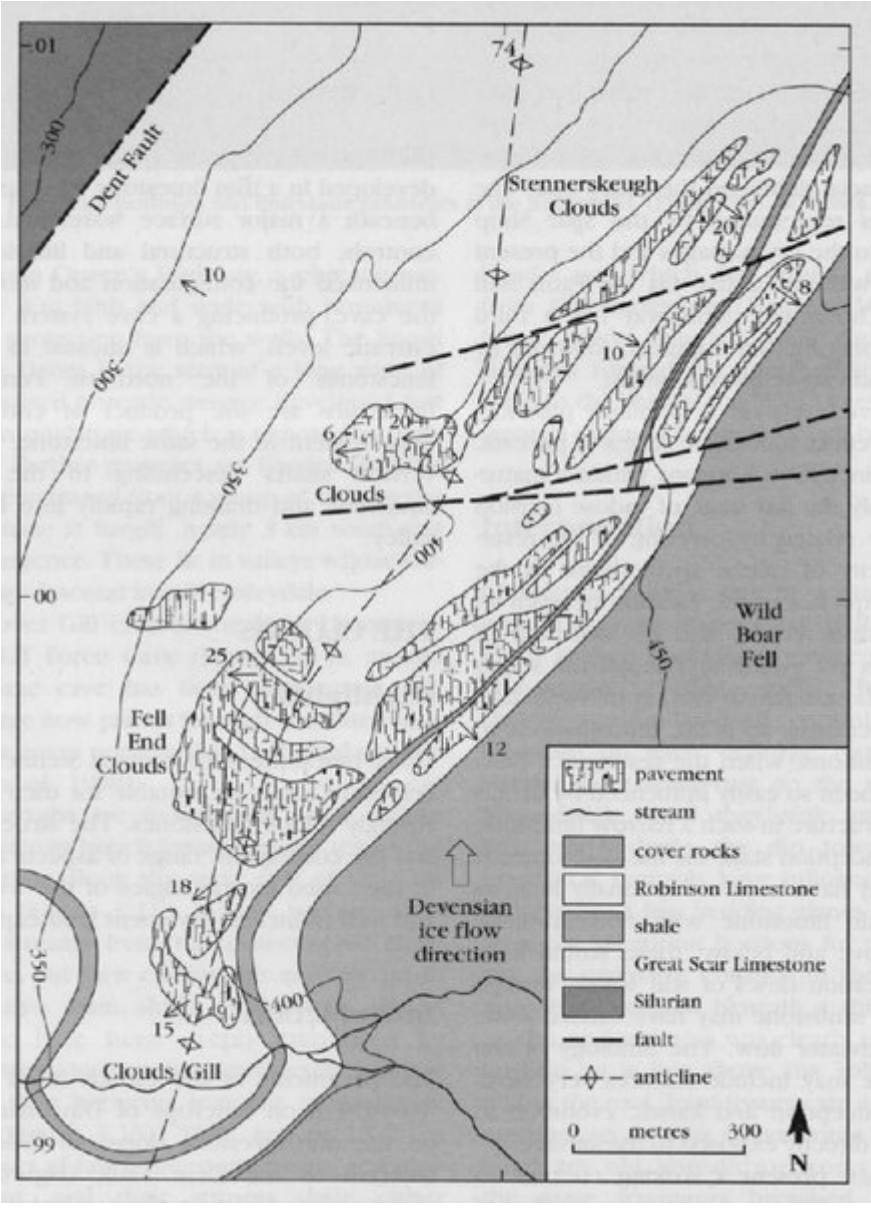


(Figure 3.14) Outline map of the limestone bench containing the Hell Gill gorge and various sinkholes, risings and cave on the adjacent streams.



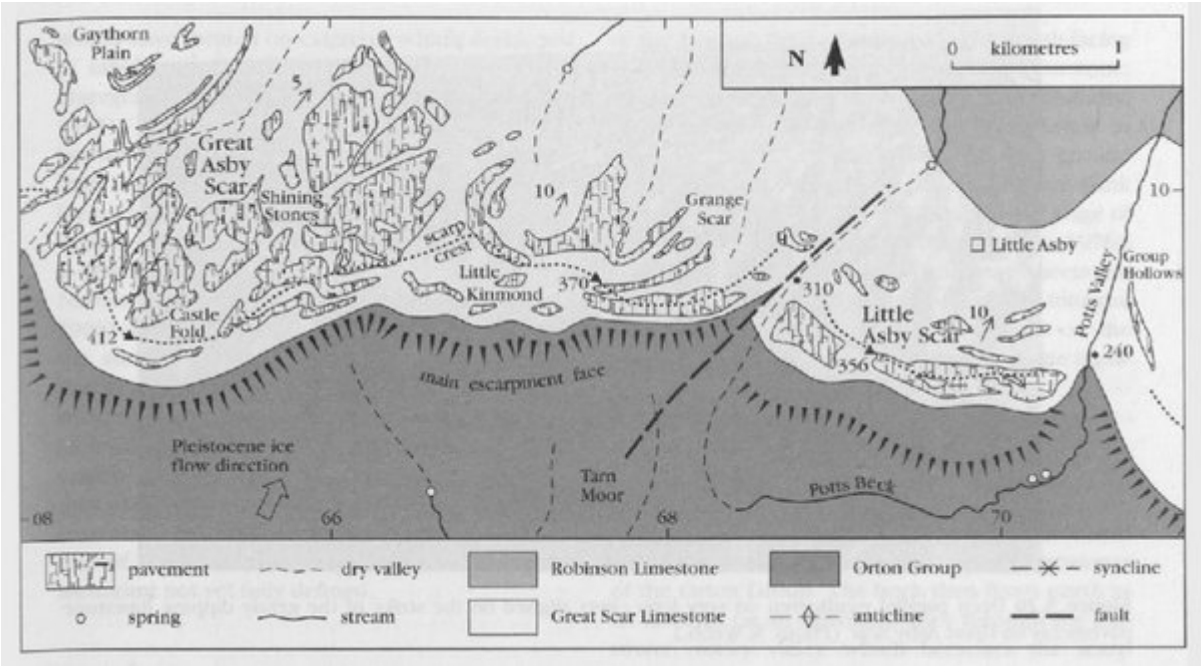
(Figure 3.15) Geological map of Cliff Force Cave and the Buttertubs. Both the Namurian cover and the underlying Dinantian rocks include thin limestones not shown and not connected to the Main Limestone (cave survey from Moldywarps Speleological Group).

(Figure 3.16) The fluted potholes and limestone pinnacles at the Buttertubs. (Photo: A.C. Waltham.)



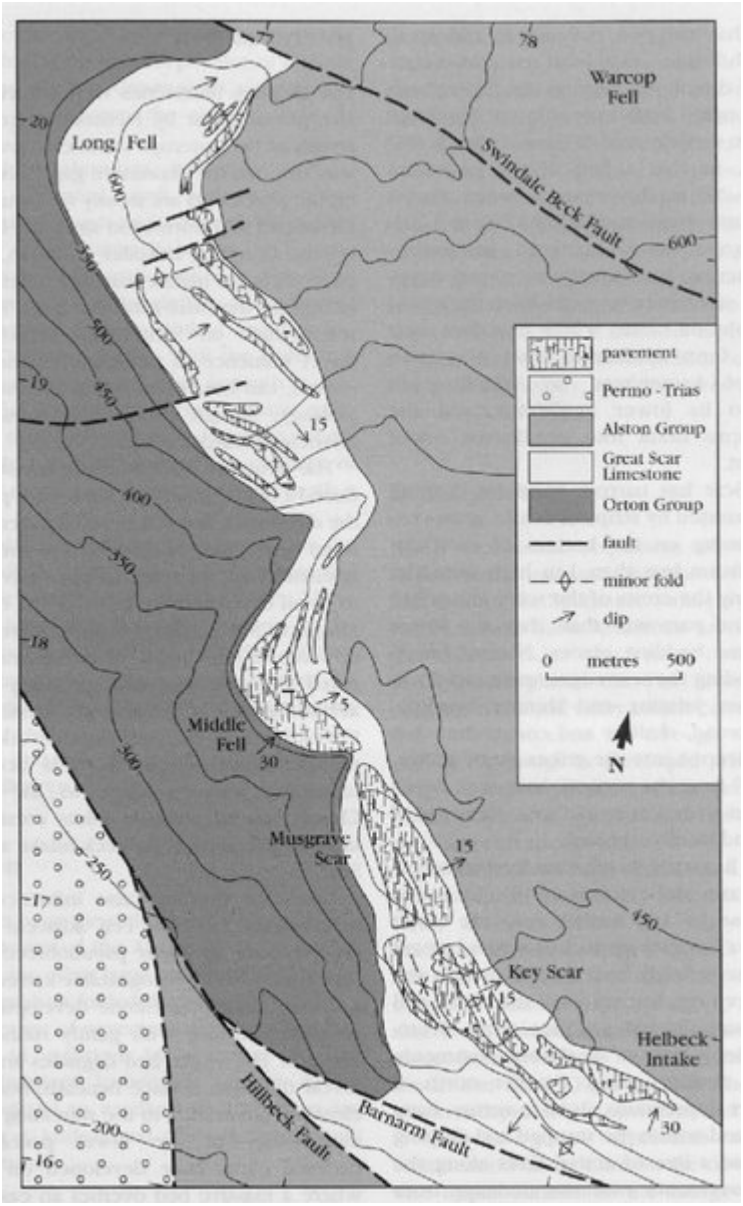
(Figure 3.17) Outline map of the limestone pavements of the Clouds. The position of the anticline axis is only approximate. Cover rocks are the alternating sequence of shales and thin limestones which follow in the Alston Group.

(Figure 3.18) Crescentic scars in strong beds of limestone folded over the anticline crest on Fell End Clouds. Pleistocene ice moved from right to left, leaving deeply tunnelled pavement in the immediate lee of the scars. (Photo: H.S. Goldie.)



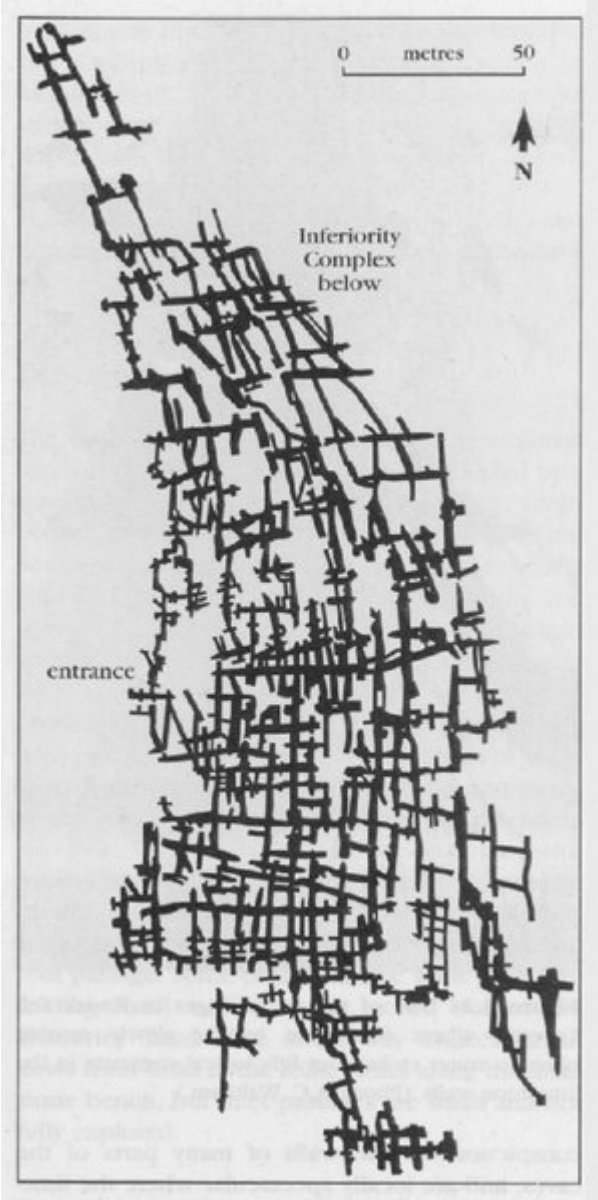
(Figure 3.19) Outline map of the karst features on the limestone escarpment between Great Asby Scar and Potts Valley. The Robinson Limestone includes a thin shale separating it from the Great Scar.

(Figure 3.20) Deep parallel rundkarren on very long clints aligned on the strike of the gently dipping limestone pavements on Great Asby Scar. (Photo: S. Webb.)

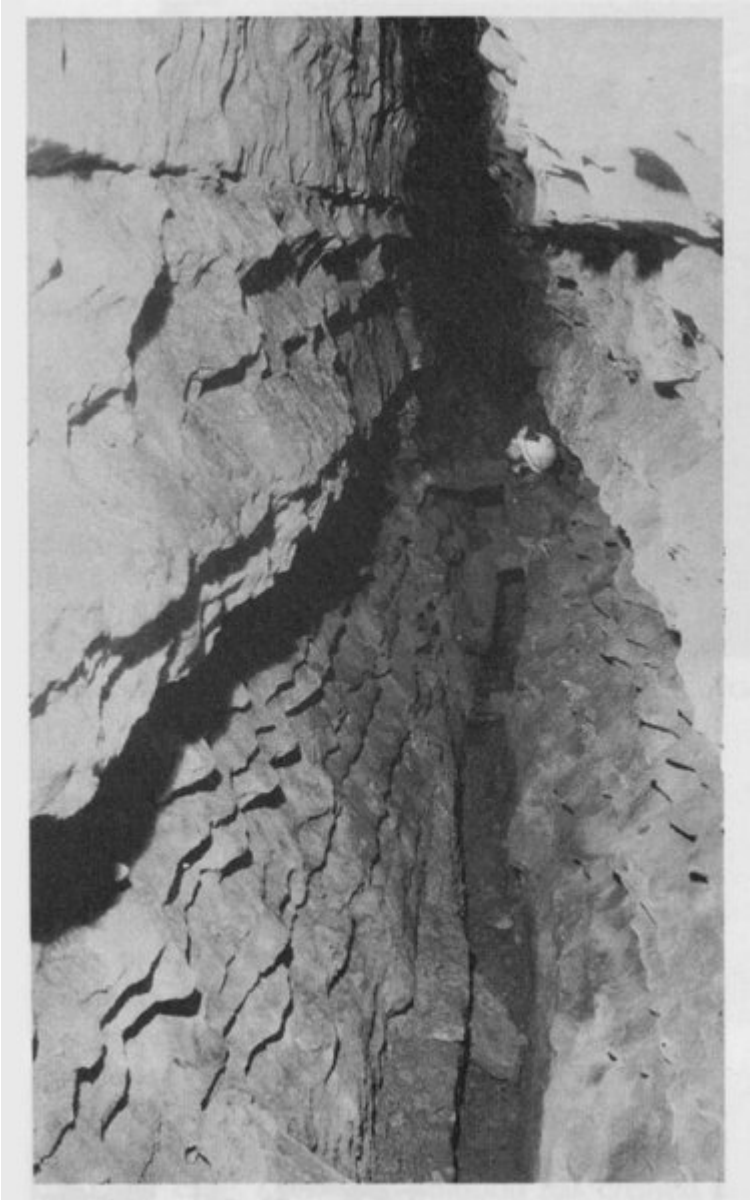


(Figure 3.21) Geological map of the pavements on the Helbeck Scars. The Alston Group includes thin limestones with low scars and narrow pavements which are not marked.

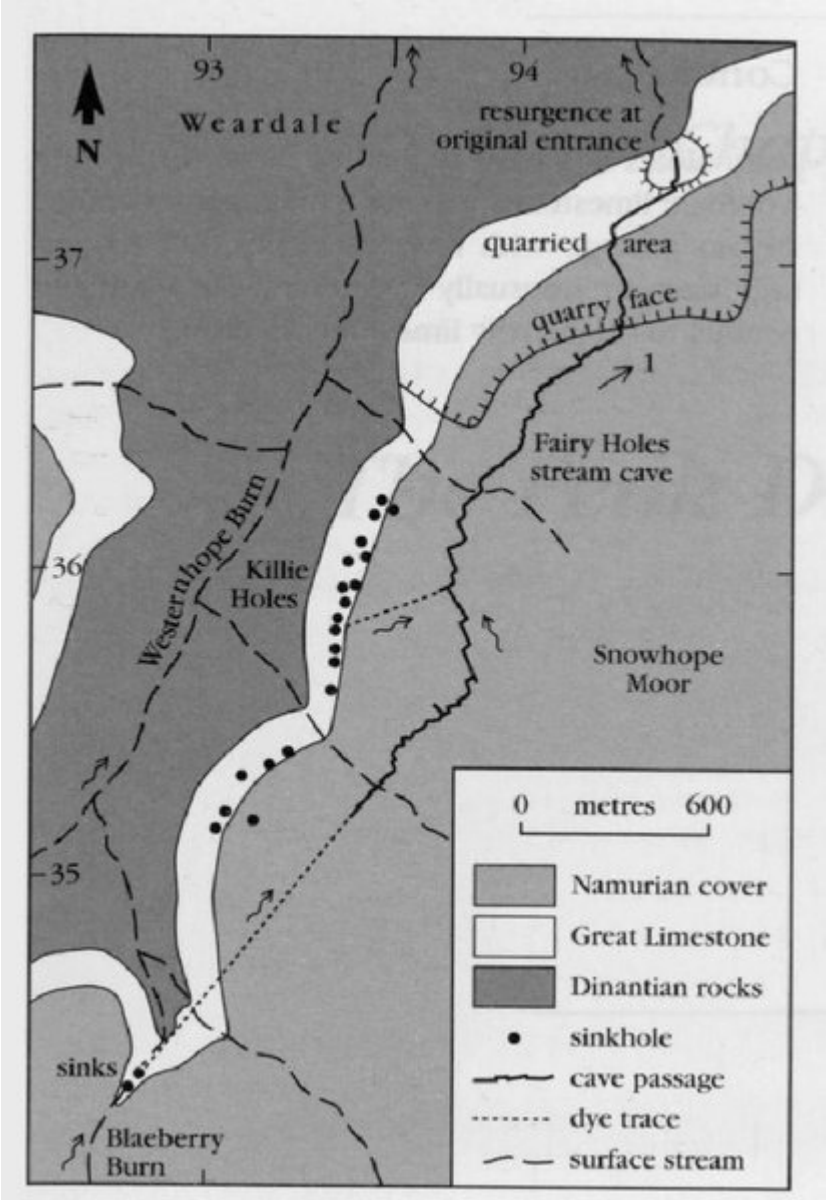
(Figure 3.22) The upstream side of the limestone span of God's Bridge across the River Greta. (Photo: A.C. Waltham.)



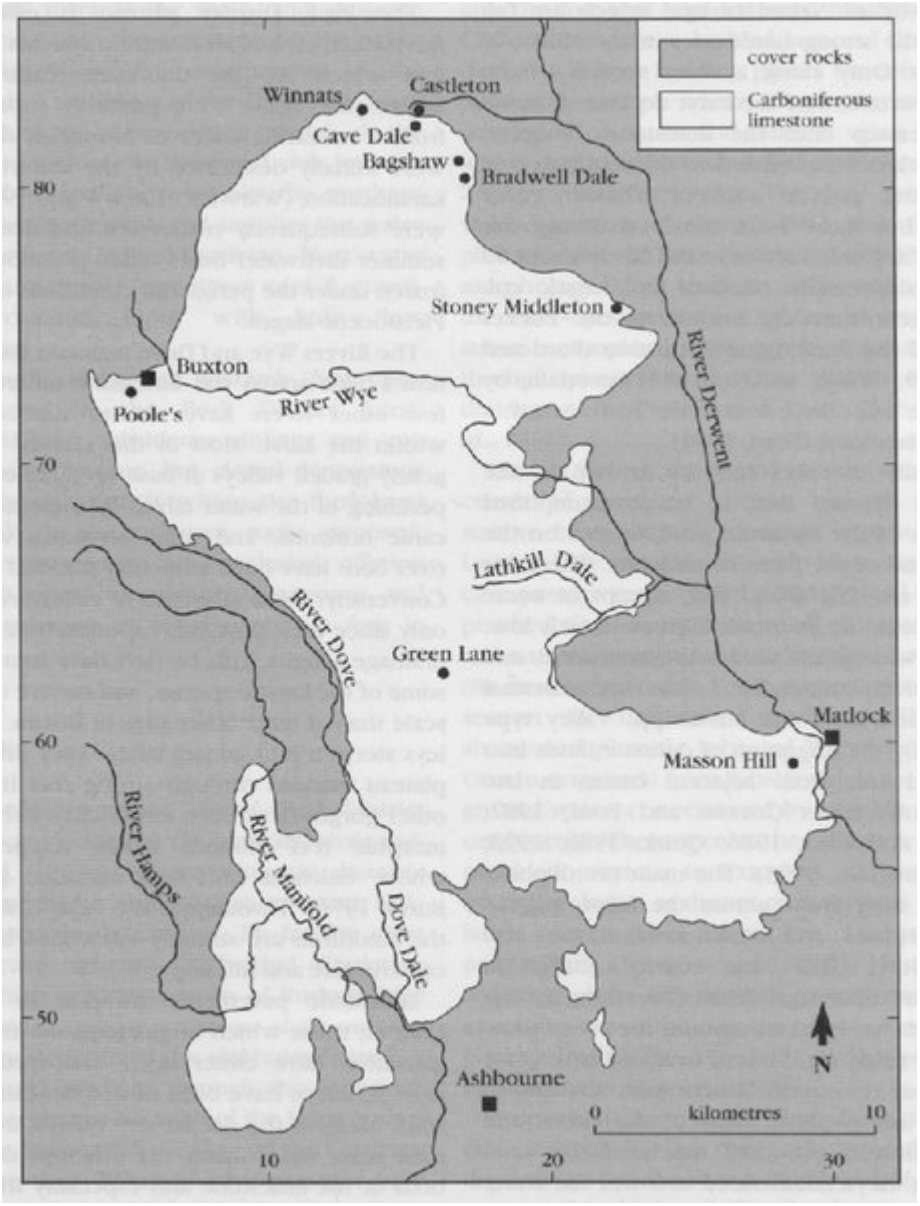
(Figure 3.23) Outline map of Knock Fell Caverns, without the much shorter lower series which are omitted for clarity (from survey by Gritstone Club).



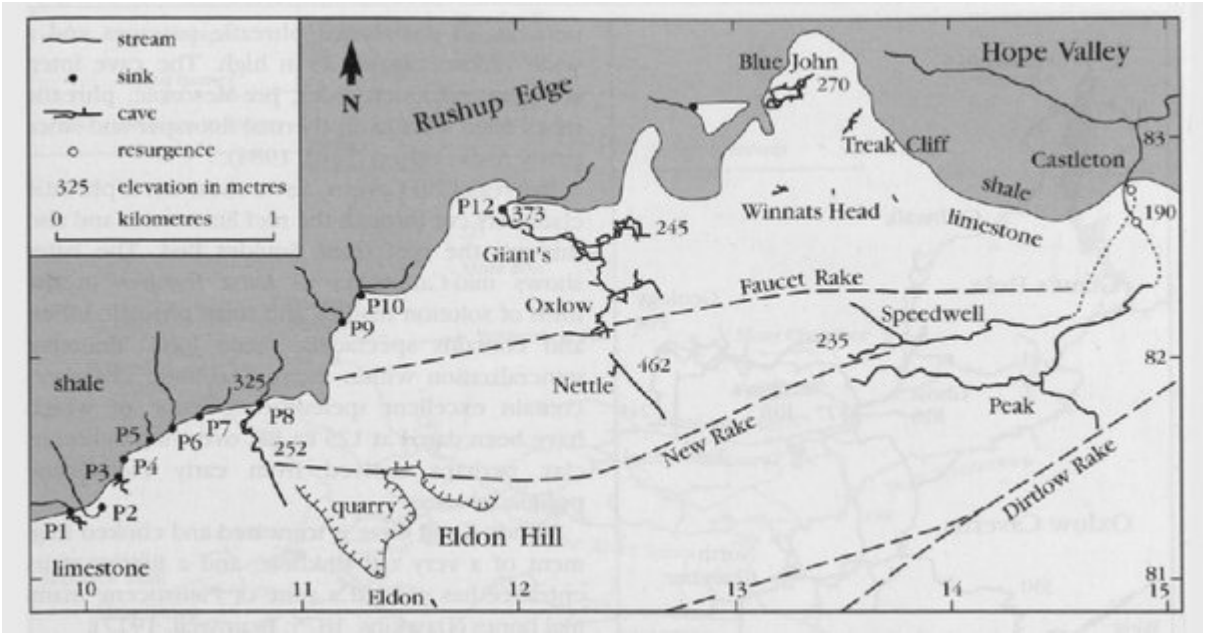
(Figure 3.24) One of the rift passages in Knock Fell Caverns, where dissolution by the slowly moving phreatic water etched out lithological contrasts in the limestone walls. (Photo: A.C. Waltham.)



(Figure 3.25) Outline map of Fairy Holes and the limestone bench which it drains. The cave and outcrops are shown in their original form, previous to development of the quarry; the limestone has been largely removed from its outcrop southwards to the quarry face, which has also cut into part of the non-carbonate cover. Except for a tiny fragment behind the original resurgence entrance, all the cave passage north of the quarry face has been destroyed (from cave survey by University of Leeds Speleological Association).

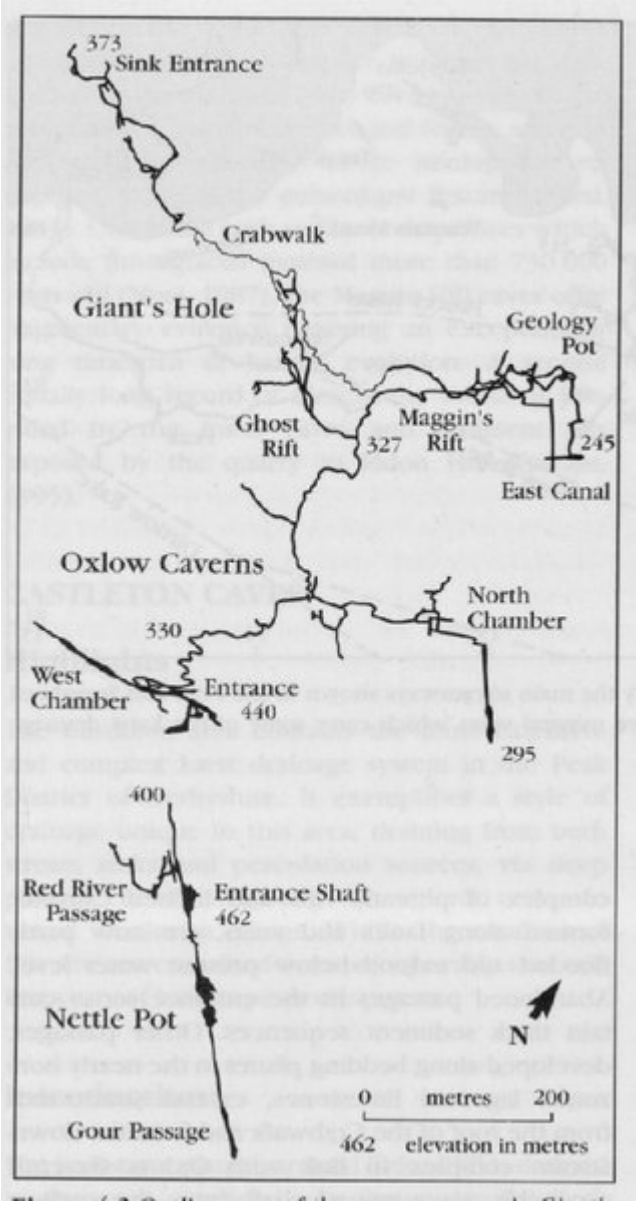


(Figure 4.1) Outline map of the Peak District karst, with locations referred to in the text. The cover rocks are Namurian shales and sandstones, and younger stratigraphic units.

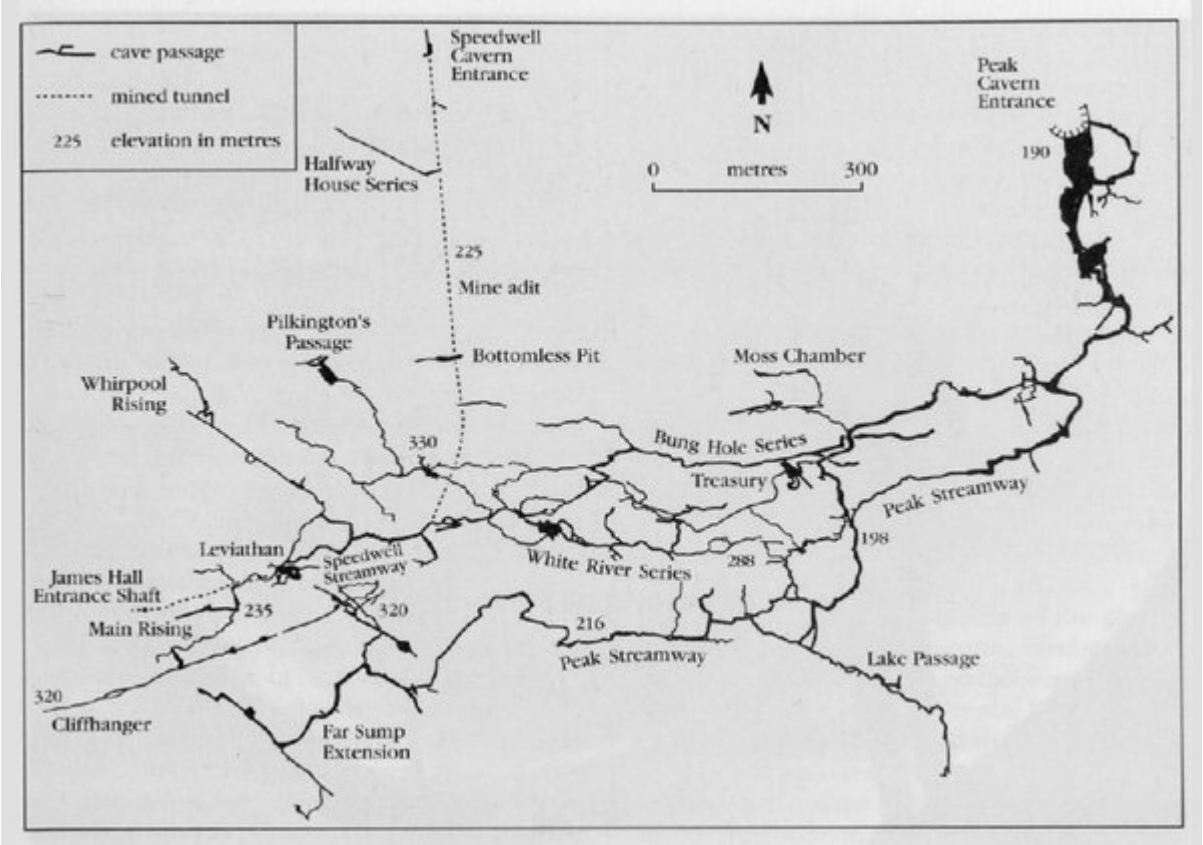


(Figure 4.2) Outline map of the Castleton caves, with only the main streamways shown in the Peak and Speedwell caves at the resurgence end of the system. The rakes are mineral veins which carry some of the karst drainage though their

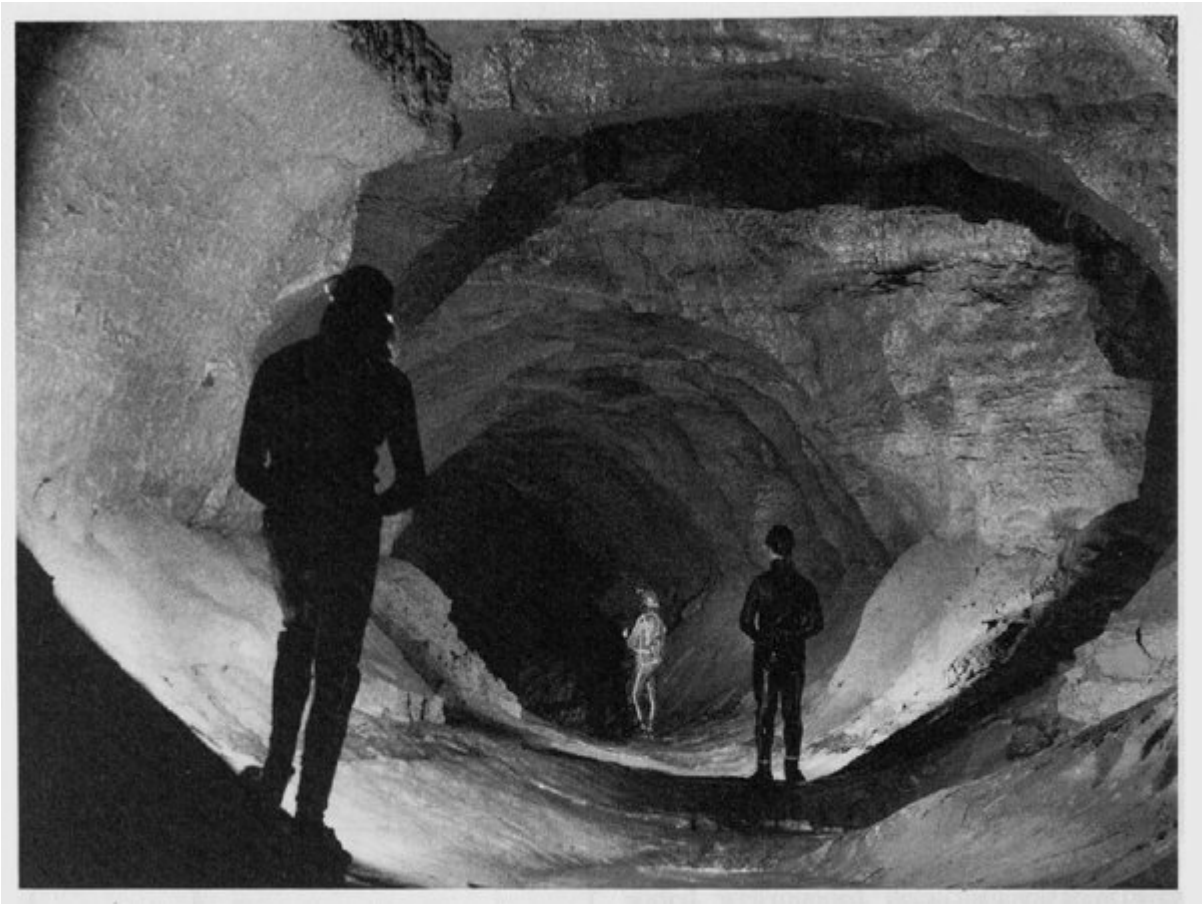
fissure systems.



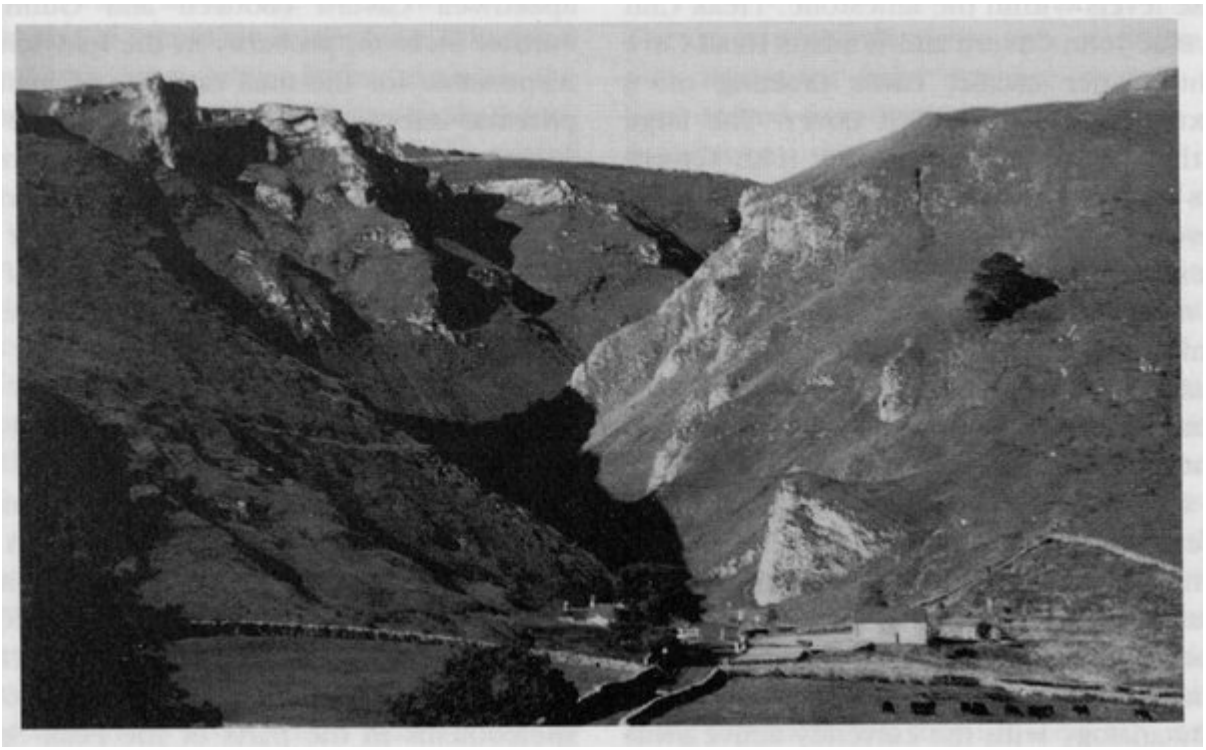
(Figure 4.3) Outline map of the cave passages in Giant's Hole, Oxlow Caverns and Nettle Pot (from surveys by Eldon Pothole Club).



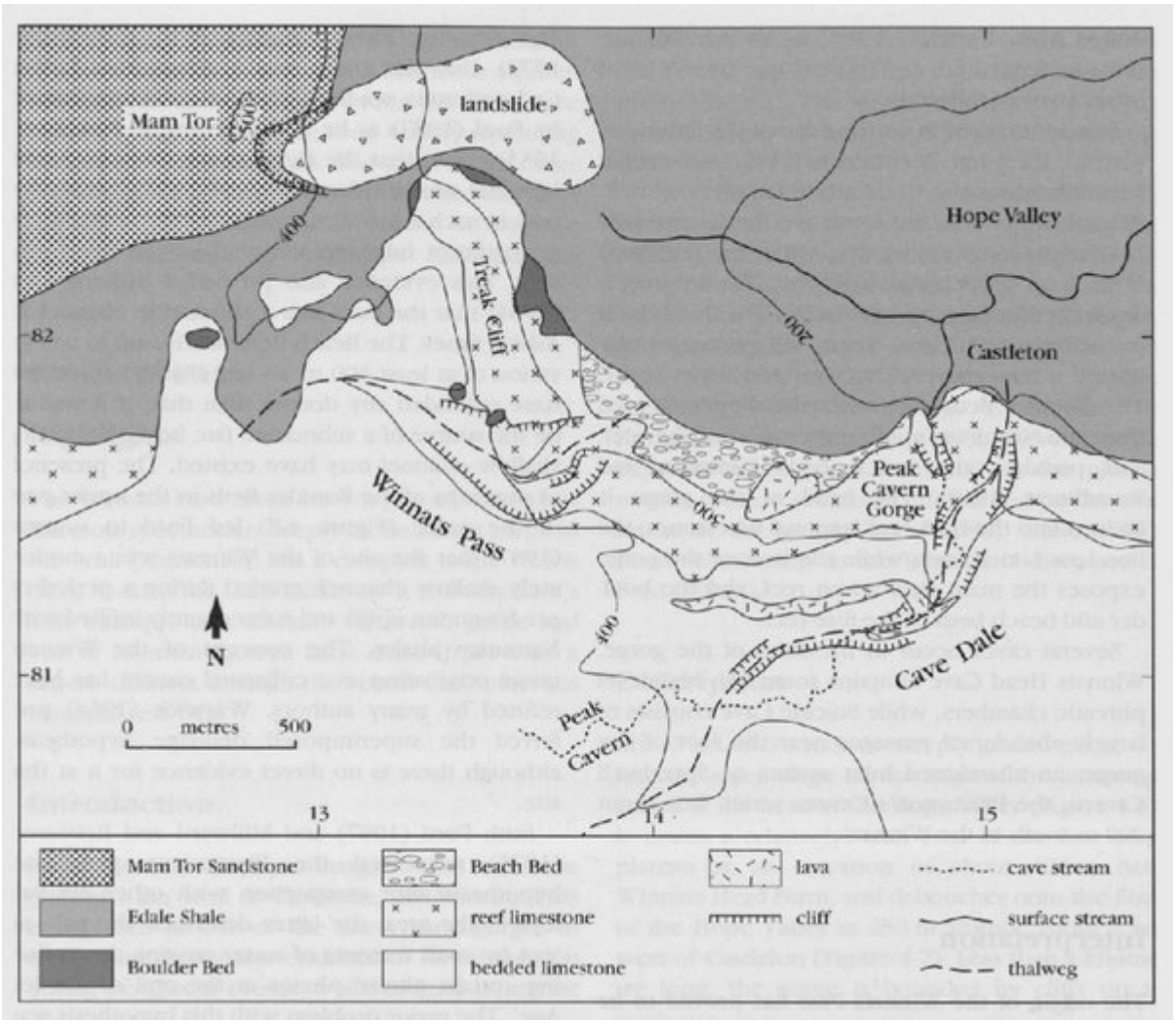
(Figure 4.4) Outline map of the Peak-Speedwell Cave System (from surveys by Technical Speleological Group and Cave Diving Group).



(Figure 4.5) The phreatic tube which forms the main part of the stream cave in Peak Cavern. The inception bedding plane is marked by the wall niches, and this section has no vadose trench yet cut in its floor. (Photo: J.R. Wooldridge.)

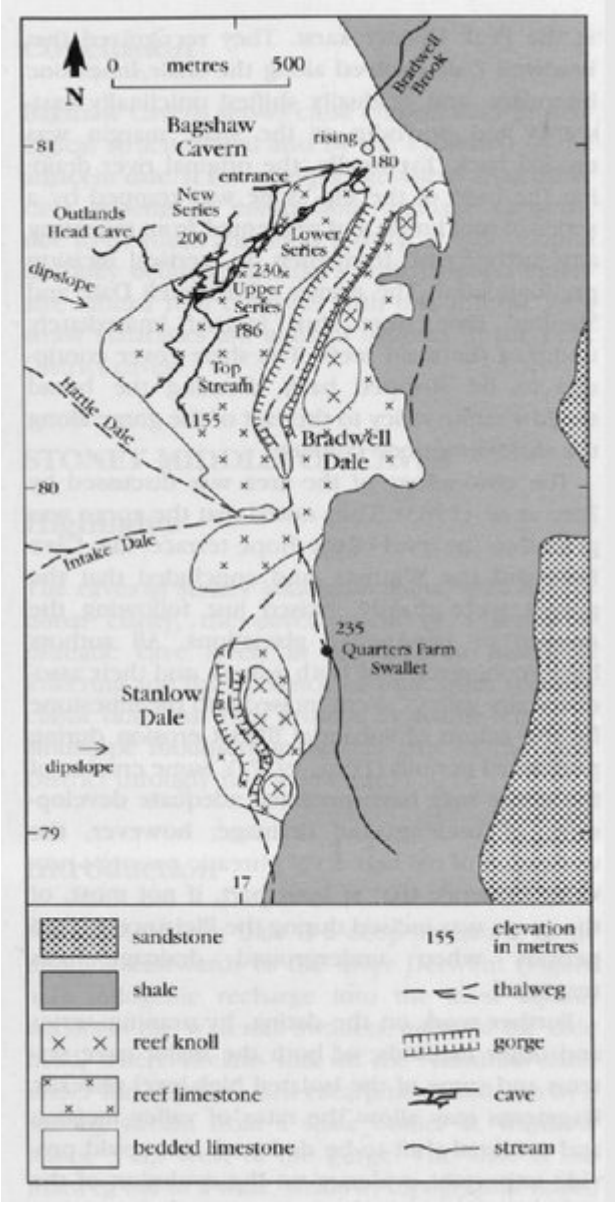


(Figure 4.6) The limestone gorge of Winnats Pass, seen from the Hope Valley. (Photo: T.D. Ford.)

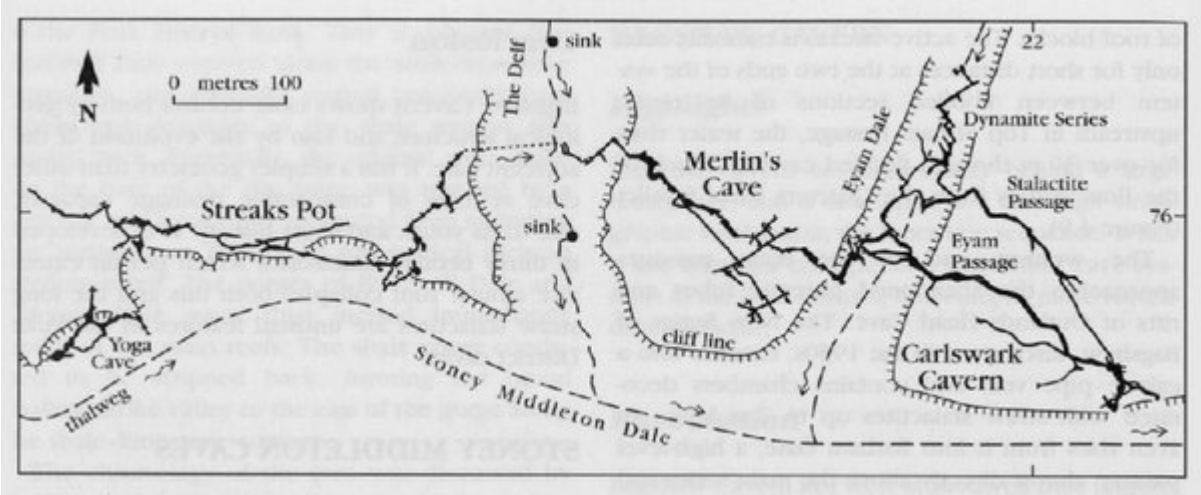


(Figure 4.7) Geological map of the Castleton reef belt containing Winnats Pass and Cave Dale.

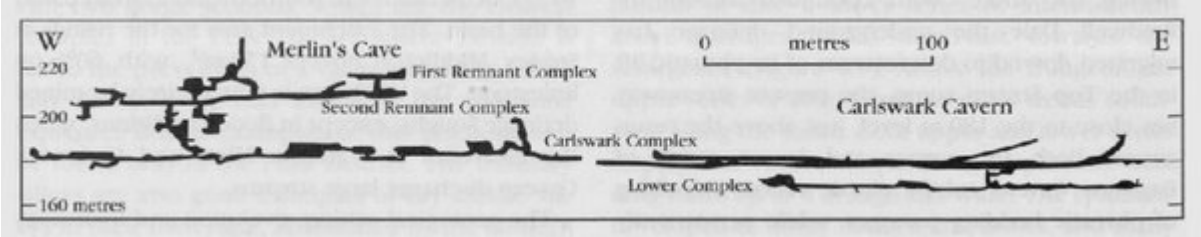
(Figure 4.8) The lower part of Cave Dale looking downstream. Peveril Castle, on the left, overlooks the head of the adjacent Peak Cavern gorge. (Photo: A.C. Waltham.)



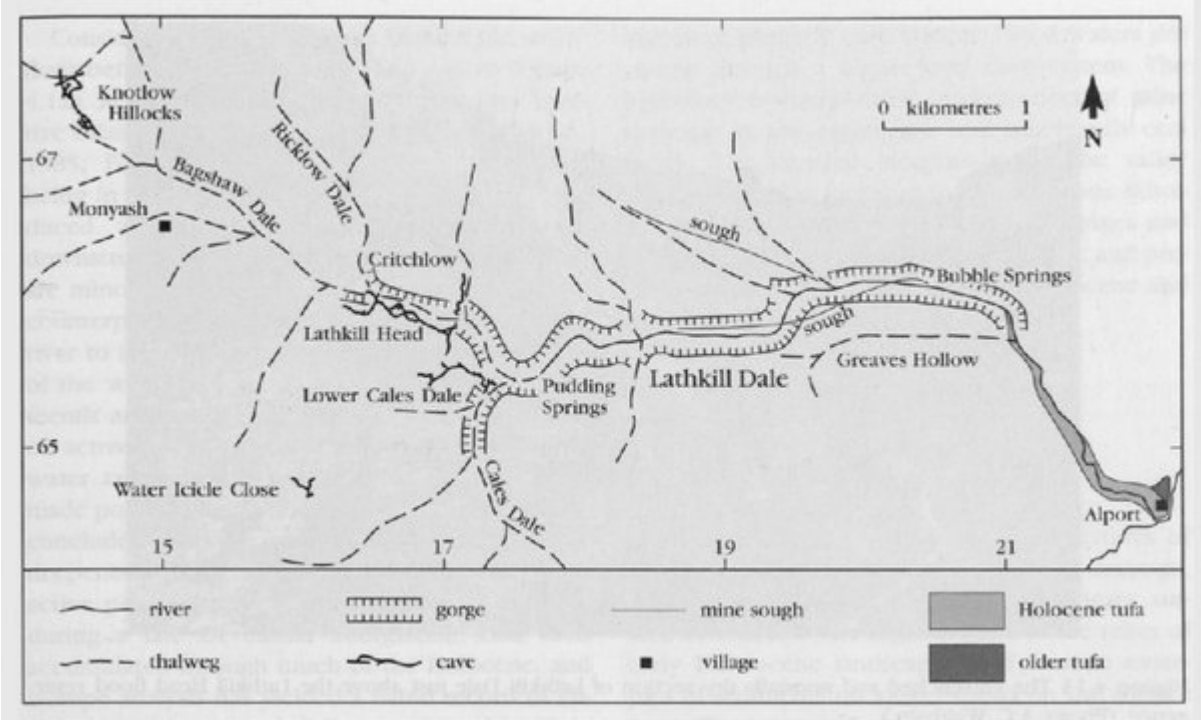
(Figure 4.9) Geological map of Bradwell Dale and Stanlow Dale. Bagshaw Cavern is shown in outline, and lies mainly in the bedded limestones beneath the reef knolls (from survey by Eyam Exploration Group).



(Figure 4.10) Outline map of the cave systems under the northern flank of Stoney Middleton Dale (from survey by Technical Speleological Group).



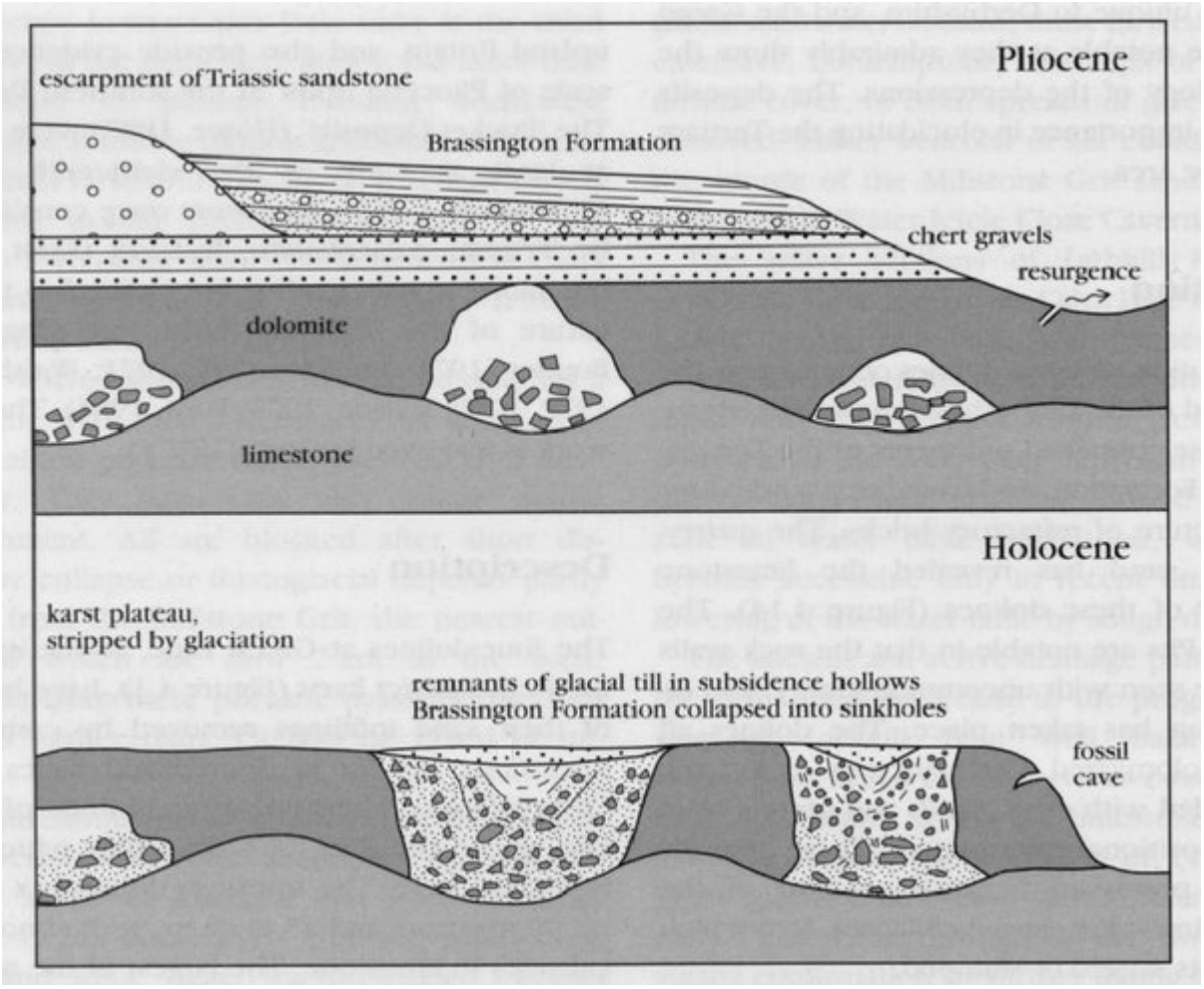
(Figure 4.11) Long profile through Merlin's Cave and Carlswark Cavern showing the development on four levels (after Christopher and Beck, 1977).



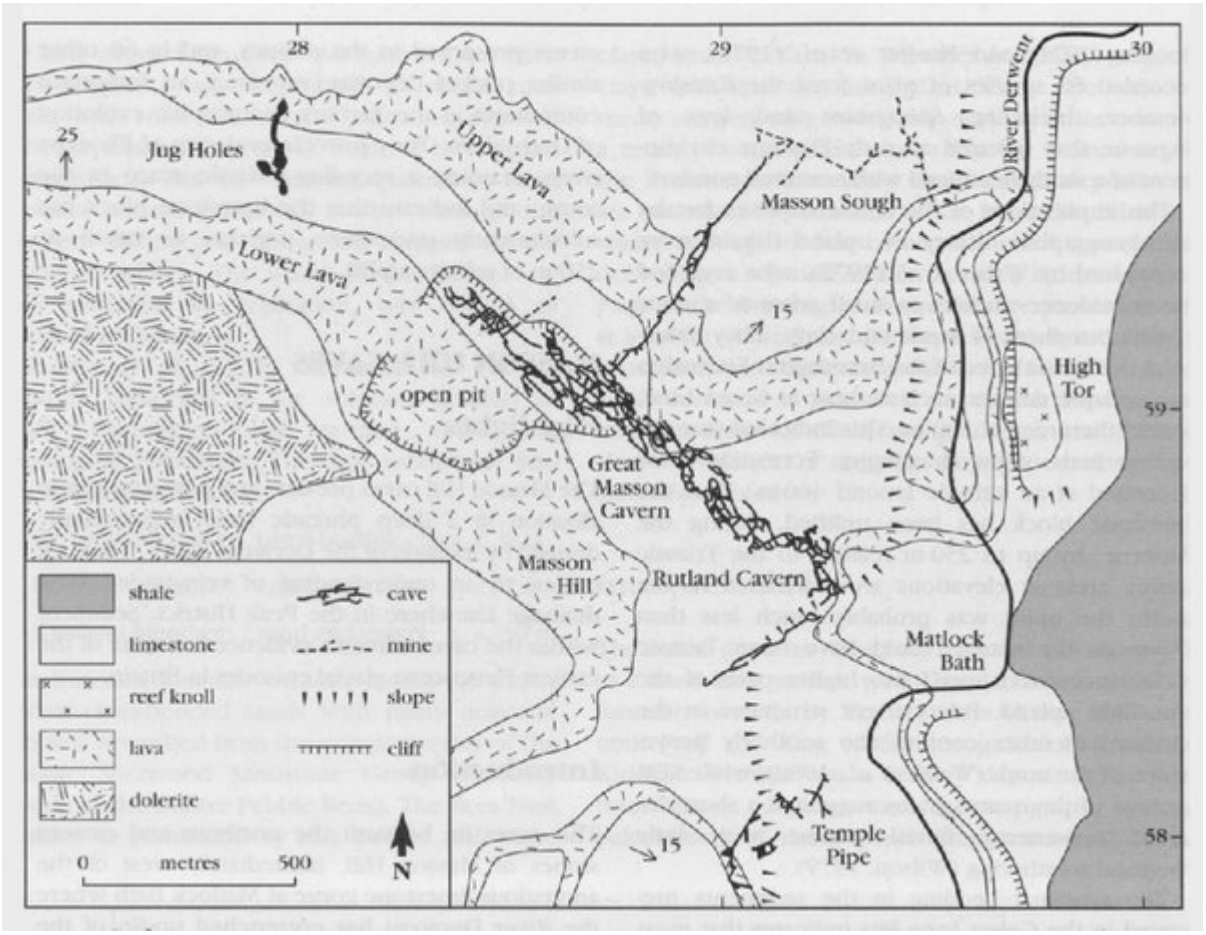
(Figure 4.12) Outline map of Lathkill Dale, its tributary dry valleys and its associated cave systems.

(Figure 4.13) The entrenched and normally dry section of Lathkill Dale just above the Lathkill Head flood resurgence. (Photo: A.C. Waltham.)

(Figure 4.14) Limestone walls and some remnants of the Pliocene sediment fill left after quarrying of the northwestern of the Green Lane Pits. (Photo: T.D. Ford.)

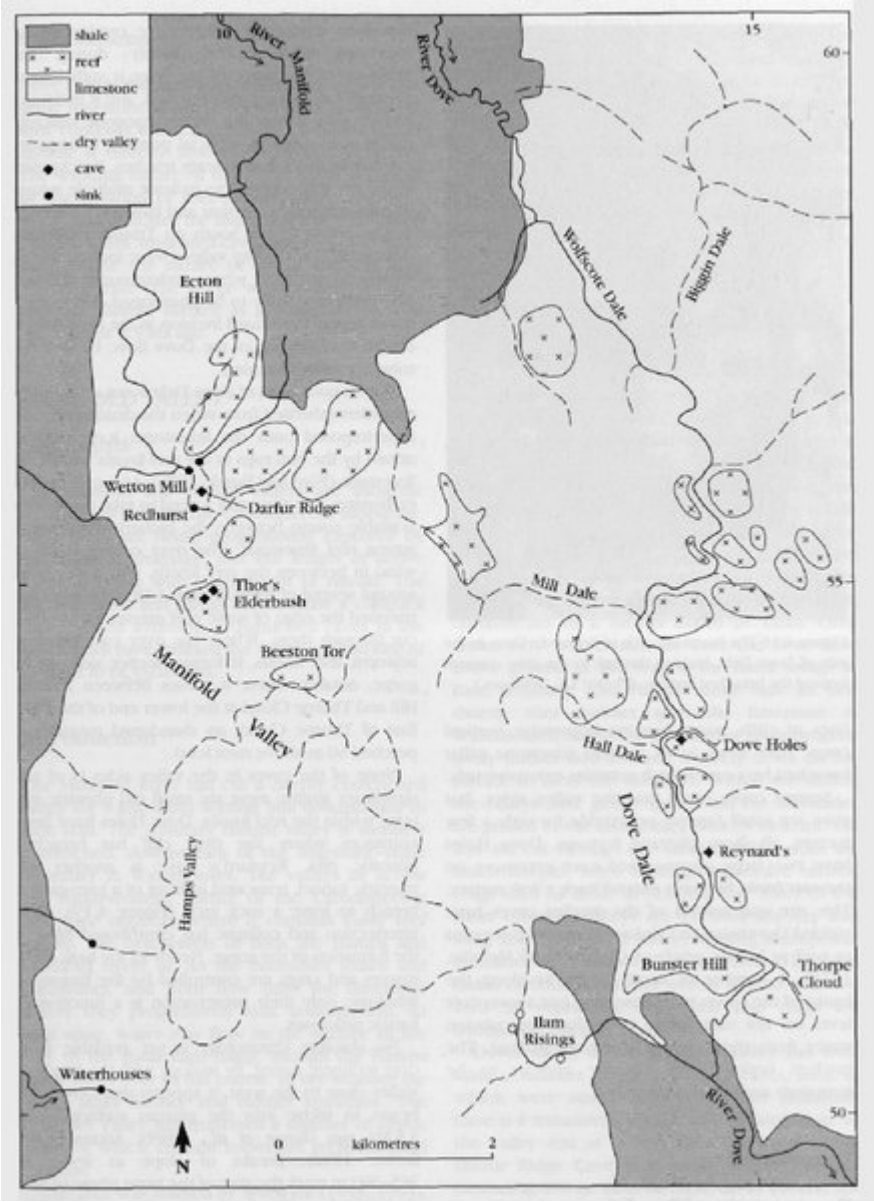


(Figure 4.15) Diagrammatic sections of two stages in the formation of the Brassington Formation and their preservation in the collapse dolines in the limestone (after Ford, 1984).

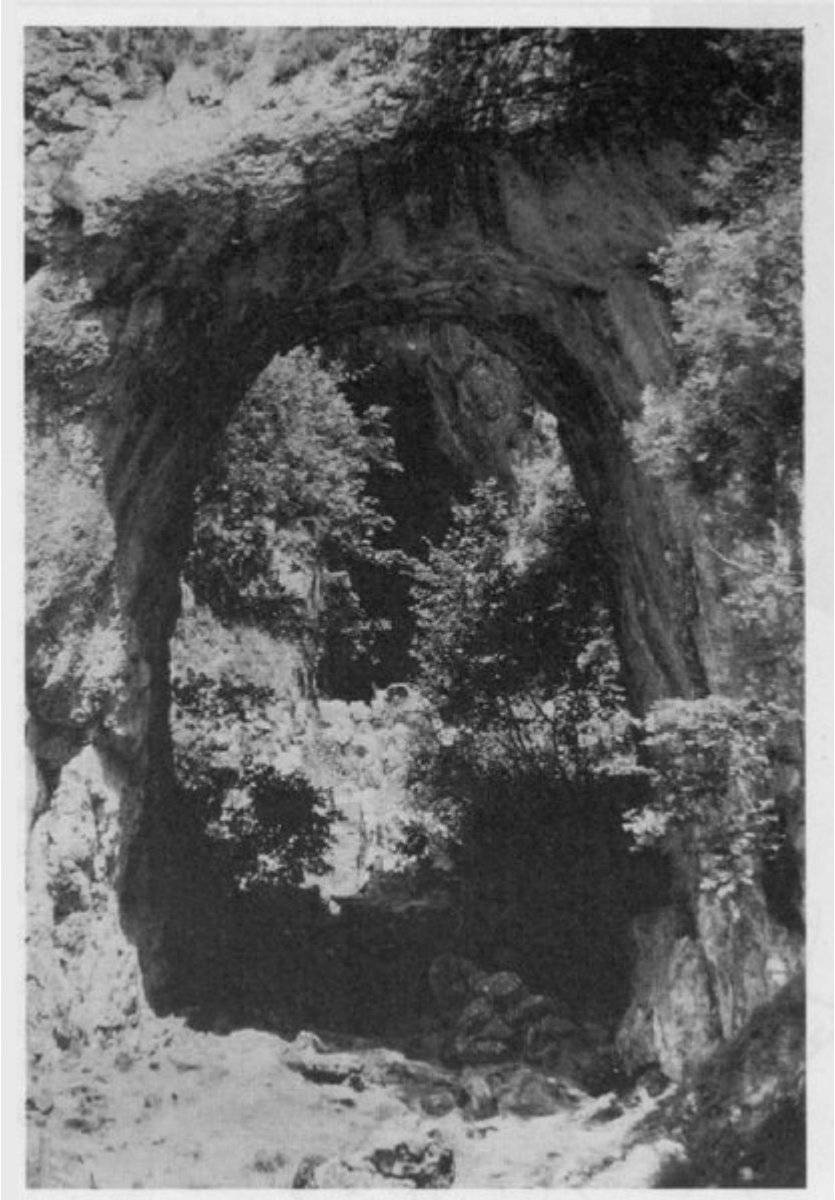


(Figure 4.16) Geological map of Masson Hill and its cave passages, in relation to the Matlock Bath gorge. The mine workings in solid rock and the re-excavated natural caves are complexly interwoven; the symbols for cave and mine are generalized. The caves within the open pit have all been destroyed.

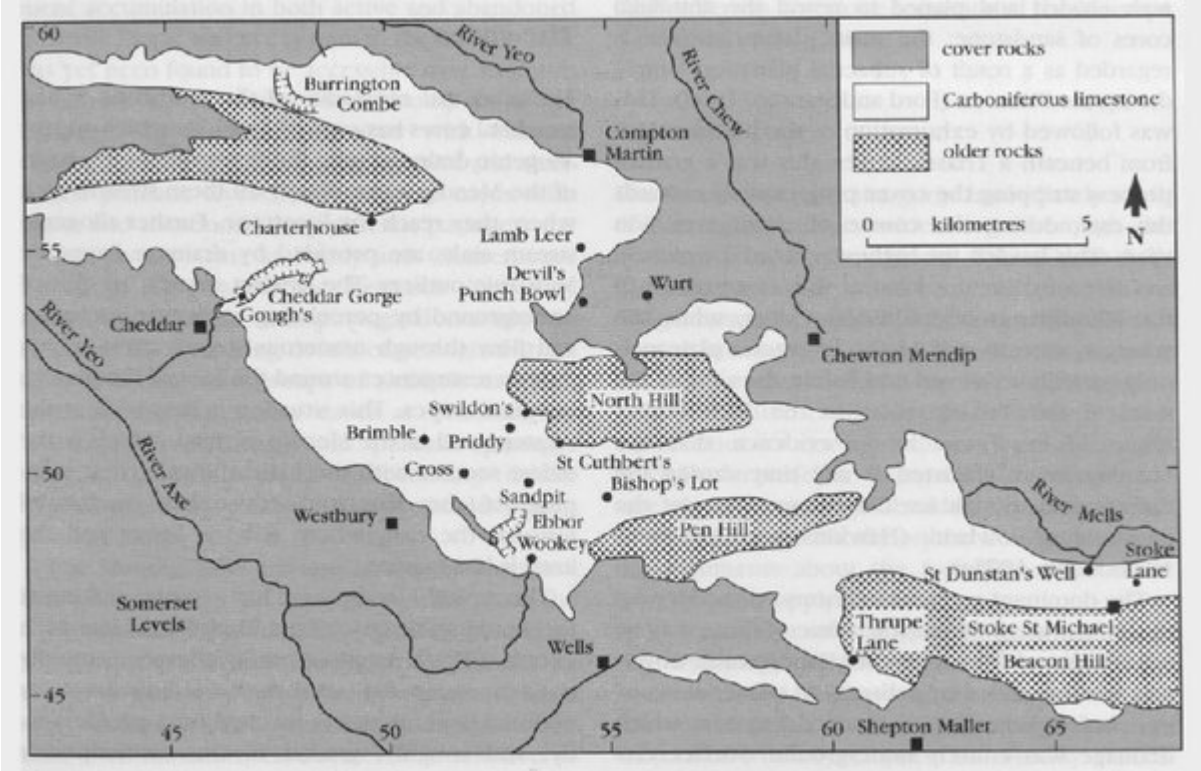
(Figure 4.17) Ribs of limestone left around solution cavities which were filled and then re-excavated by miners in the Black Ox Mine workings in Great Masson Cavern. (Photo: T.D. Ford.)



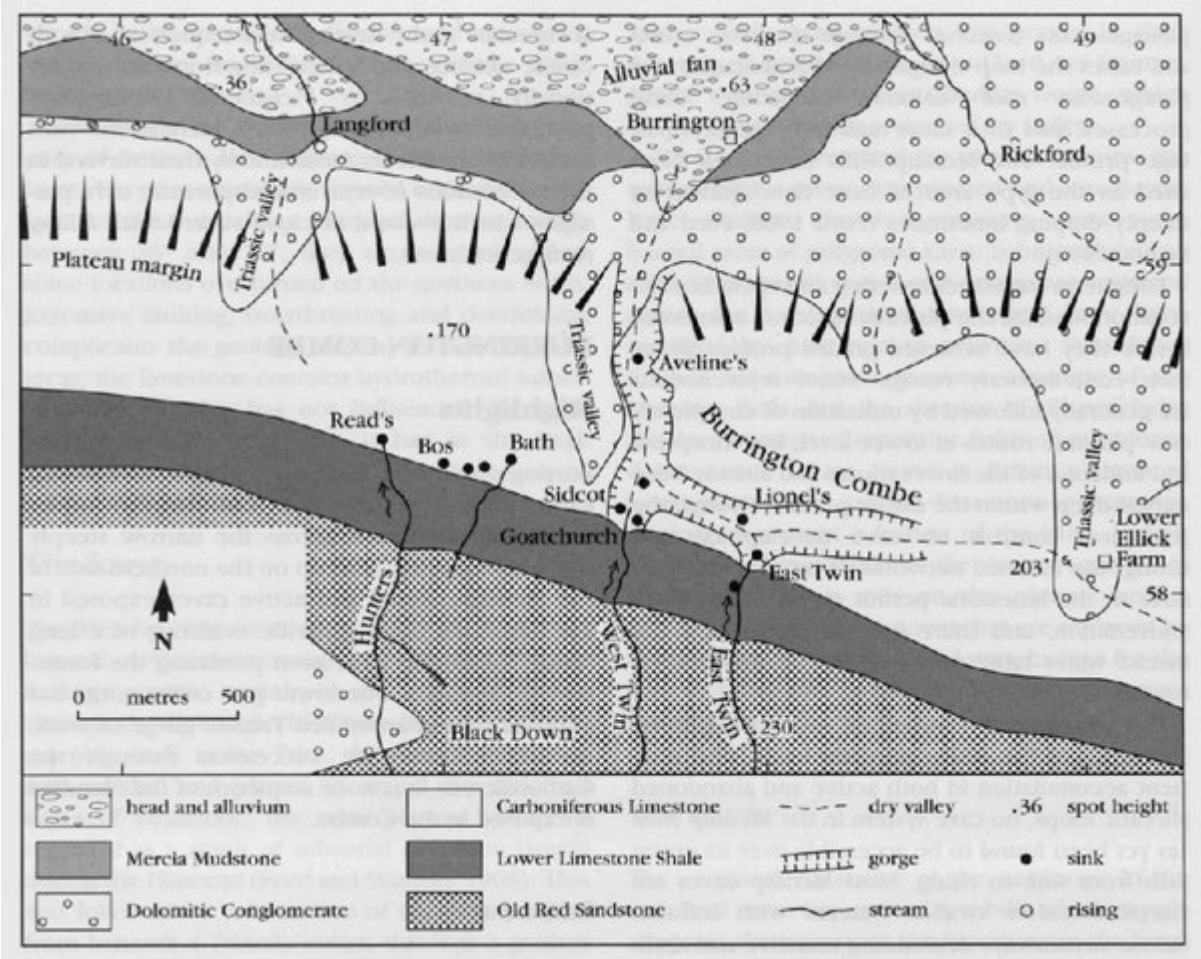
(Figure 4.18) Geological map of the active and dry valley systems of Dove Dale and the Manifold River in relation to the reef knolls in the Carboniferous limestone (partly after Ford and Burek, 1976).



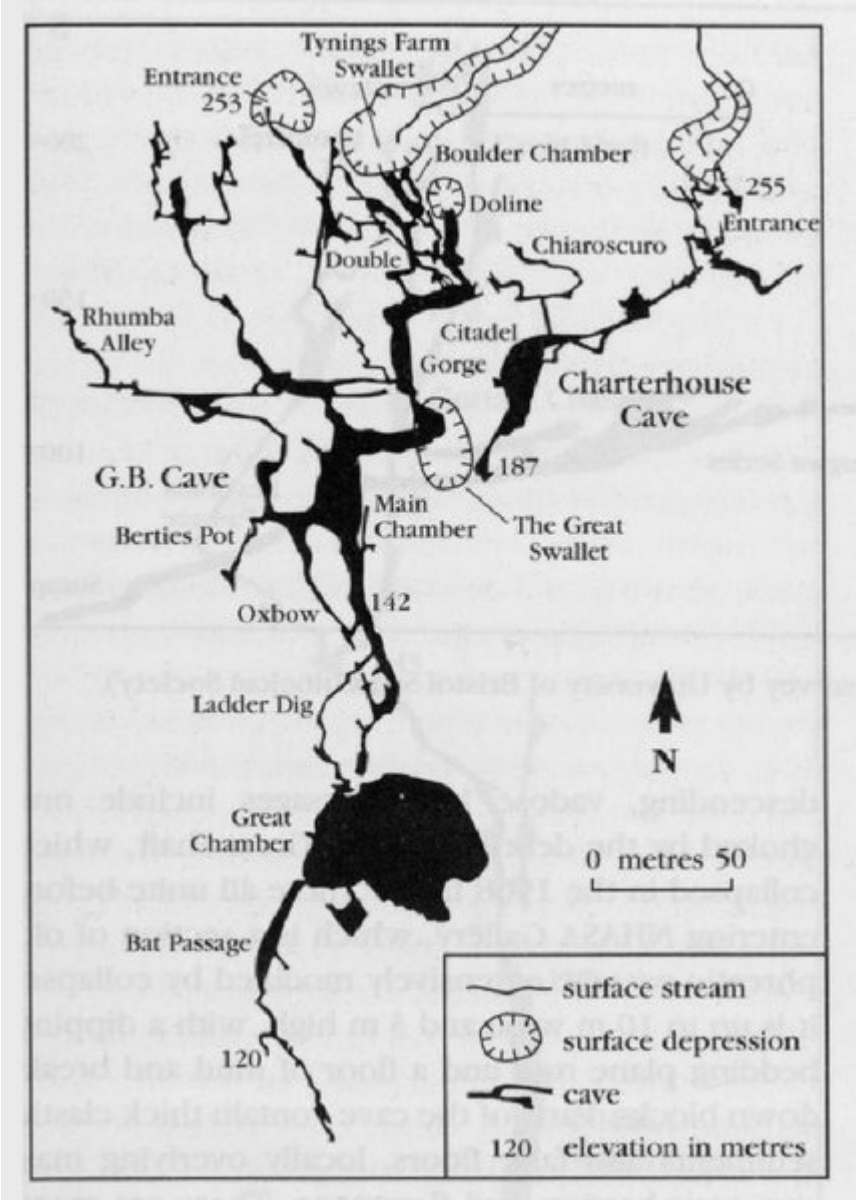
(Figure 4.19) The limestone arch of Reynard's Cave, in the side of Dove Dale, looking through to the cave remnant beyond the breached section. (Photo: A.C. Waltham.)



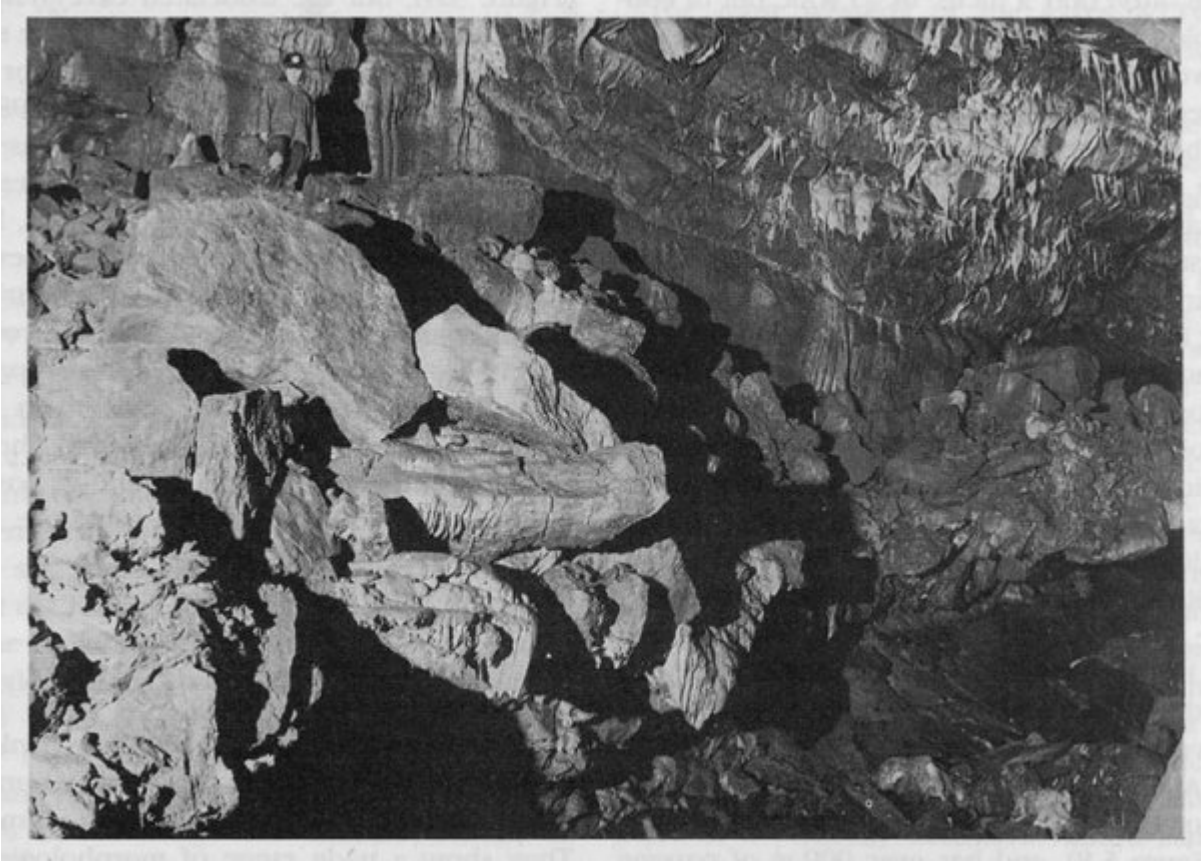
(Figure 5.1) Outline map of the Mendip Hills karst, with locations referred to in the text. Cover rocks are mostly the Triassic and Jurassic mudstones and limestones; Upper Carboniferous rocks form the thrusted outlier on the east side of Ebbor Gorge. The Triassic Dolomitic Conglomerate is included with the Carboniferous limestone where it is composed of blocks of the limestone and is an integral part of the karst. Older rocks are the Devonian Old Red Sandstone and the Dinantian Lower Limestone Shale.



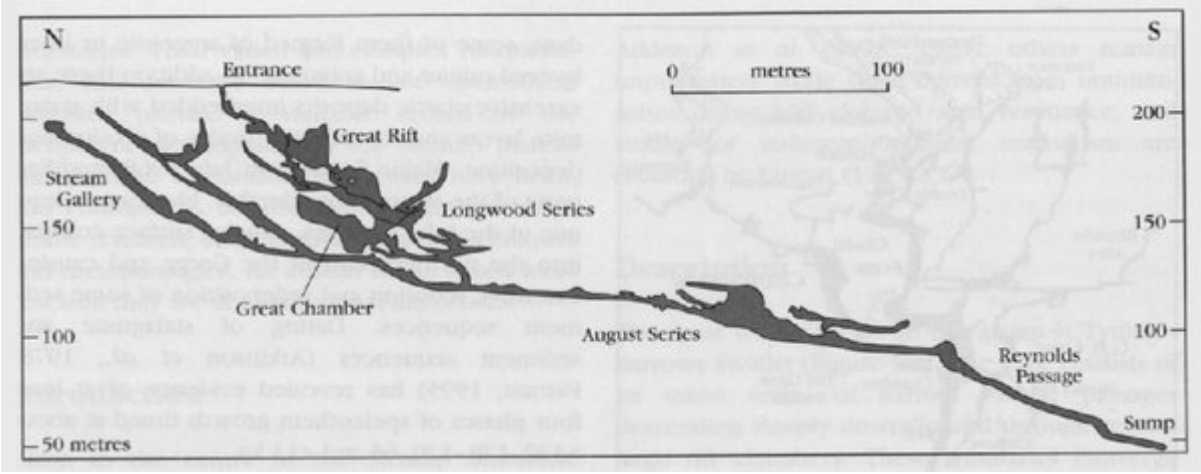
(Figure 5.2) Geological map of Burrington Combe and the infilled Triassic valleys cut into the northern slope of the Mendip Hills (after Williams and Farrant, 1992).



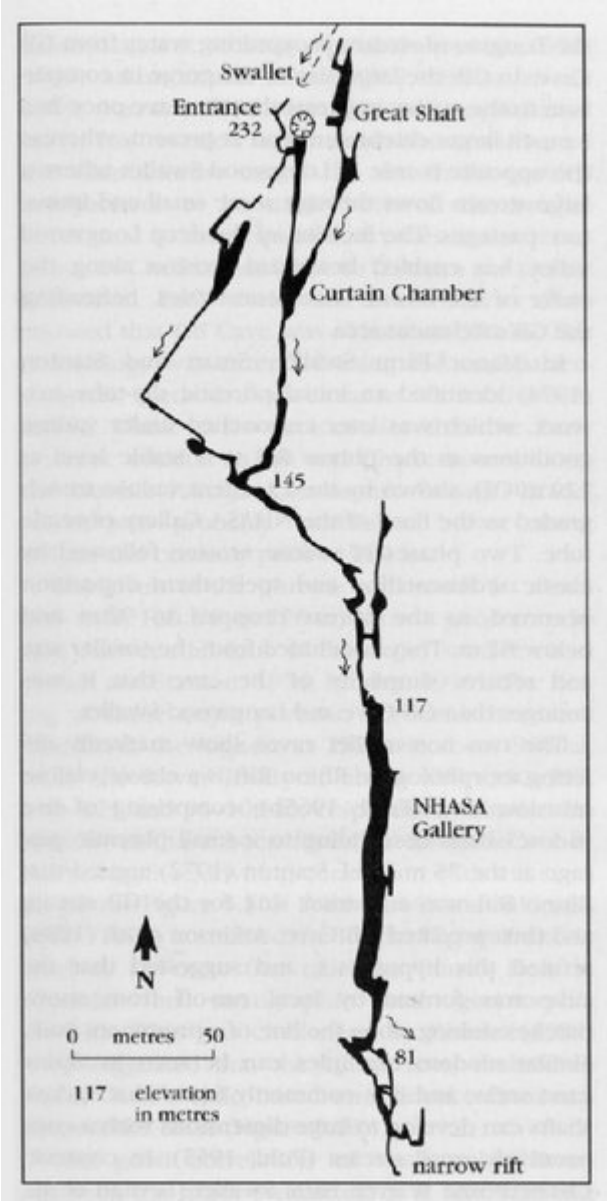
(Figure 5.3) Outline map of GB Cave, Charterhouse Cave and the main surface features above them (from survey by University of Bristol Speleological Society).



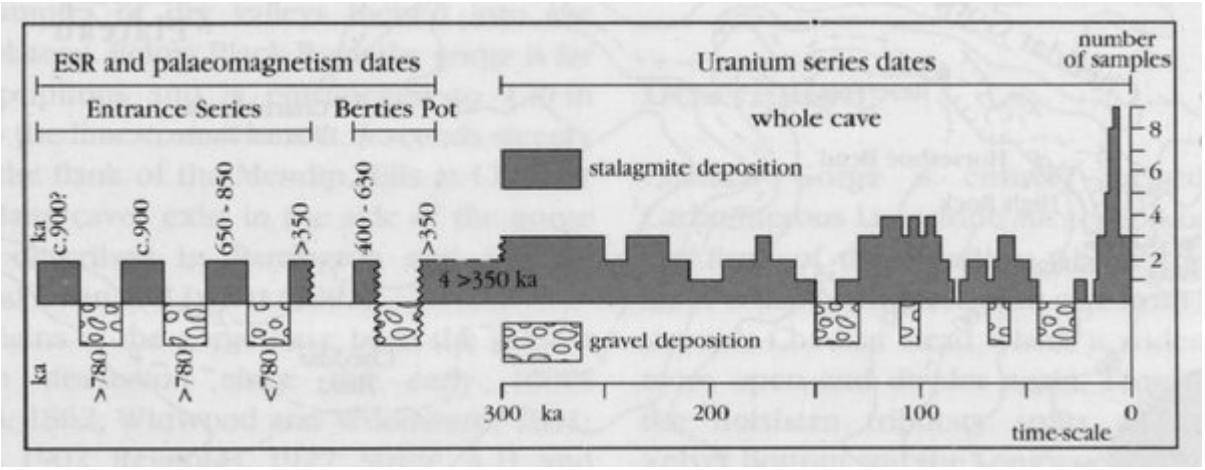
(Figure 5.4) Massive banks, terraces and false floors of coarse breakdown, clastics and stalagmite flowstone in the Gorge of GB Cave. (Photo; A.C. Waltham.)



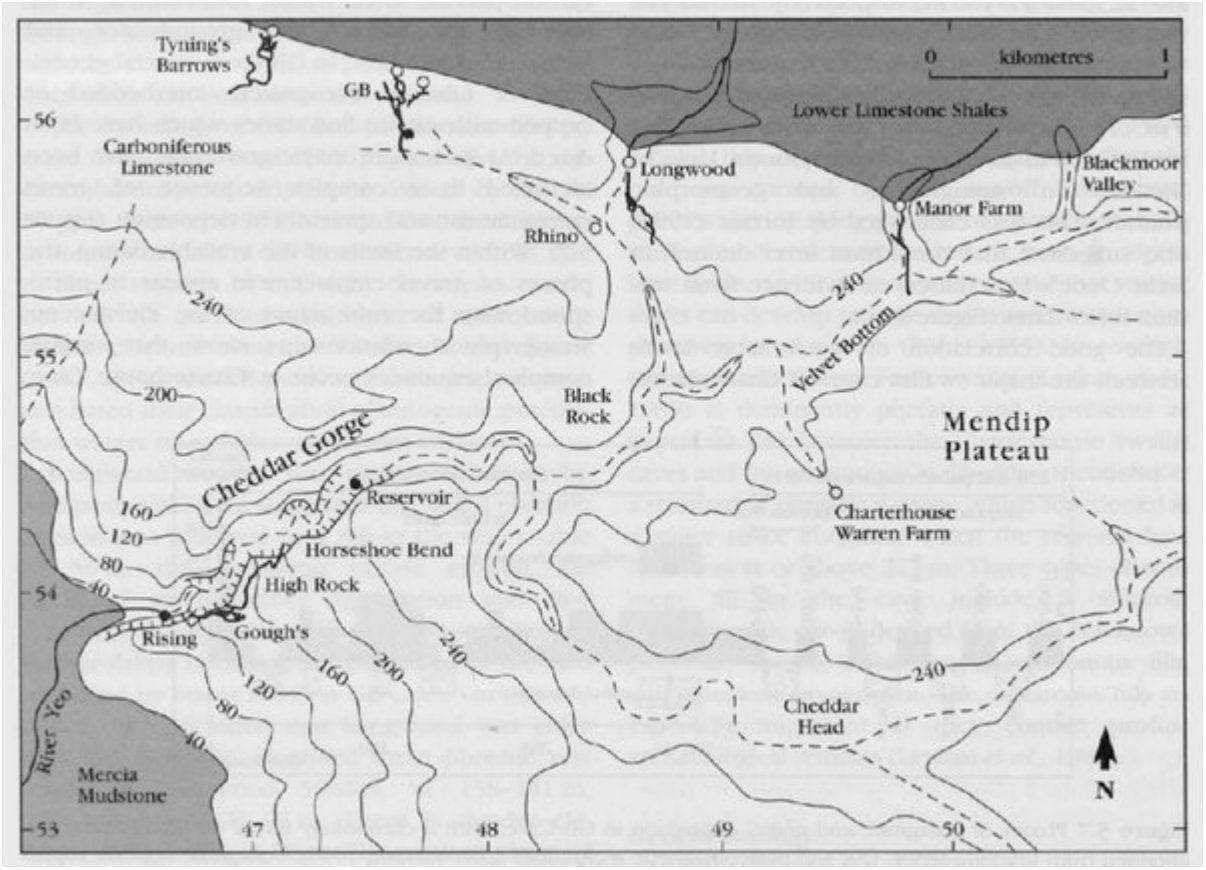
(Figure 5.5) Extended profile of Longwood Swallet (from survey by University of Bristol Speleological Society).



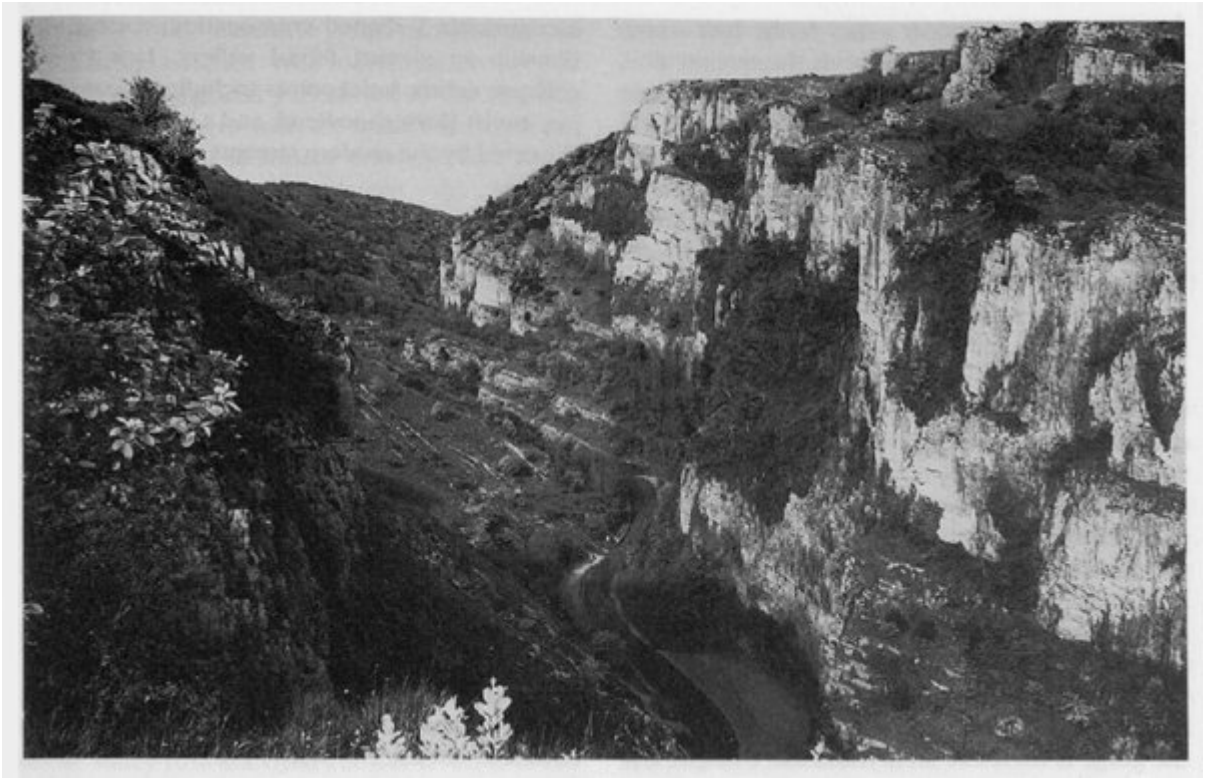
(Figure 5.6) Outline map of Manor Farm Swallet (from survey by University of Bristol Speleological Society).



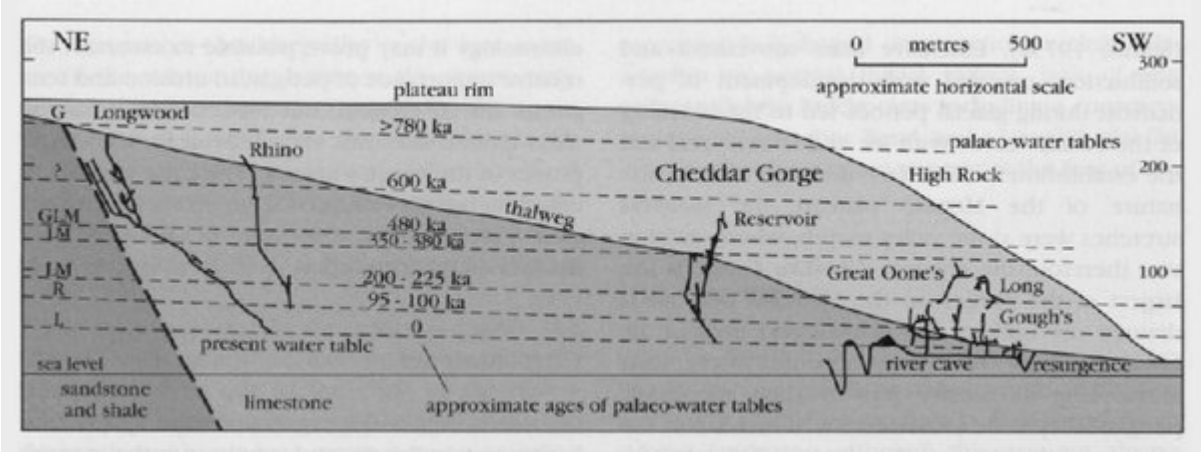
(Figure 5.7) Phases of stalagmite and gravel deposition in GB Cave, with a chronology based on stalagmite dates obtained from uranium-series, ESR and palaeomagnetic techniques (after Farrant, 1995). Stalagmite ages are represented covering the error bars on the dated samples; actual time spans of the deposition phases may be smaller, but data from stalagmites as yet undated may increase the lengths of the deposition phases.



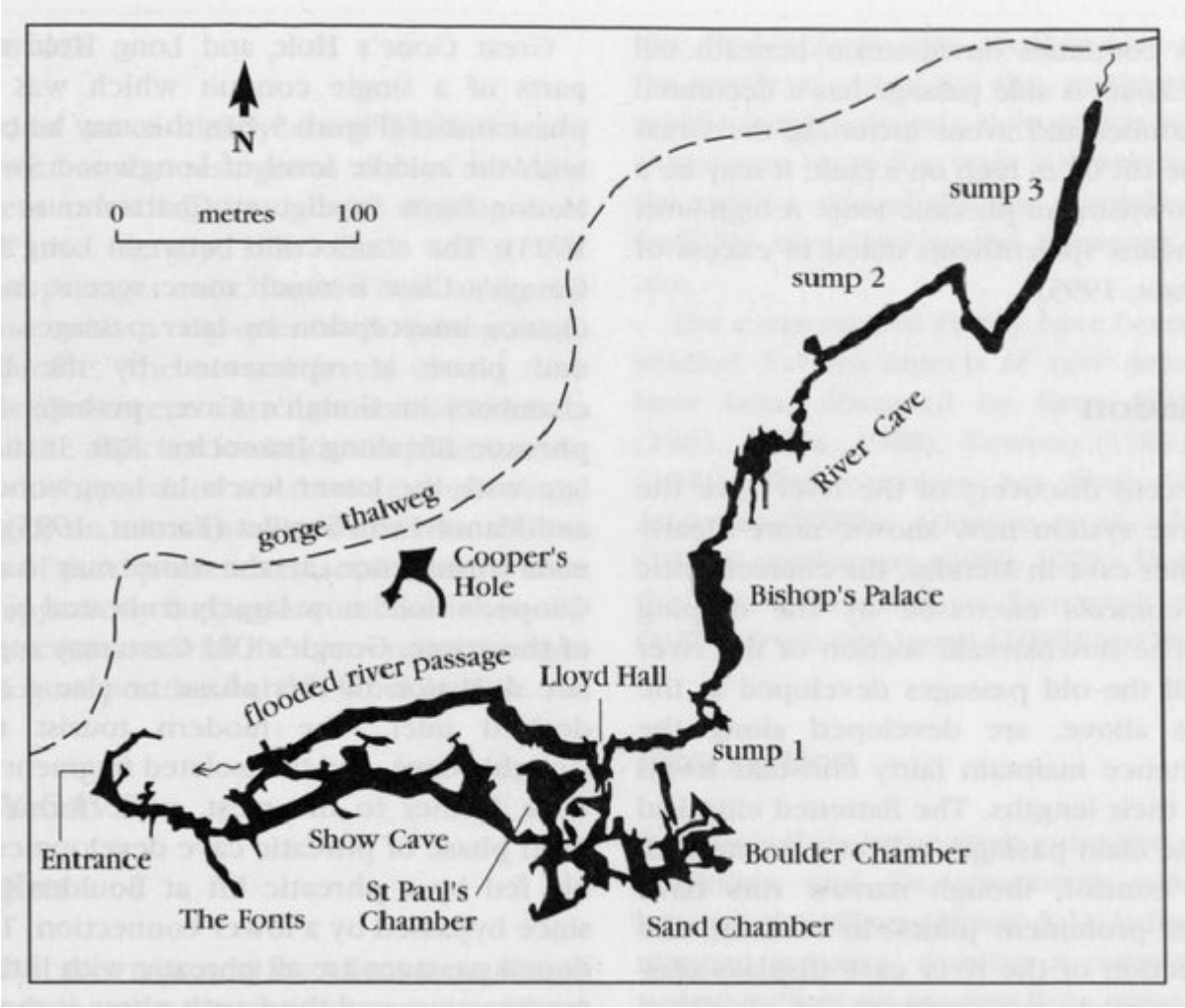
(Figure 5.8) Map of Cheddar Gorge and the lower part of its dry valley system reaching across the karst to the edge of the Mendip Plateau.



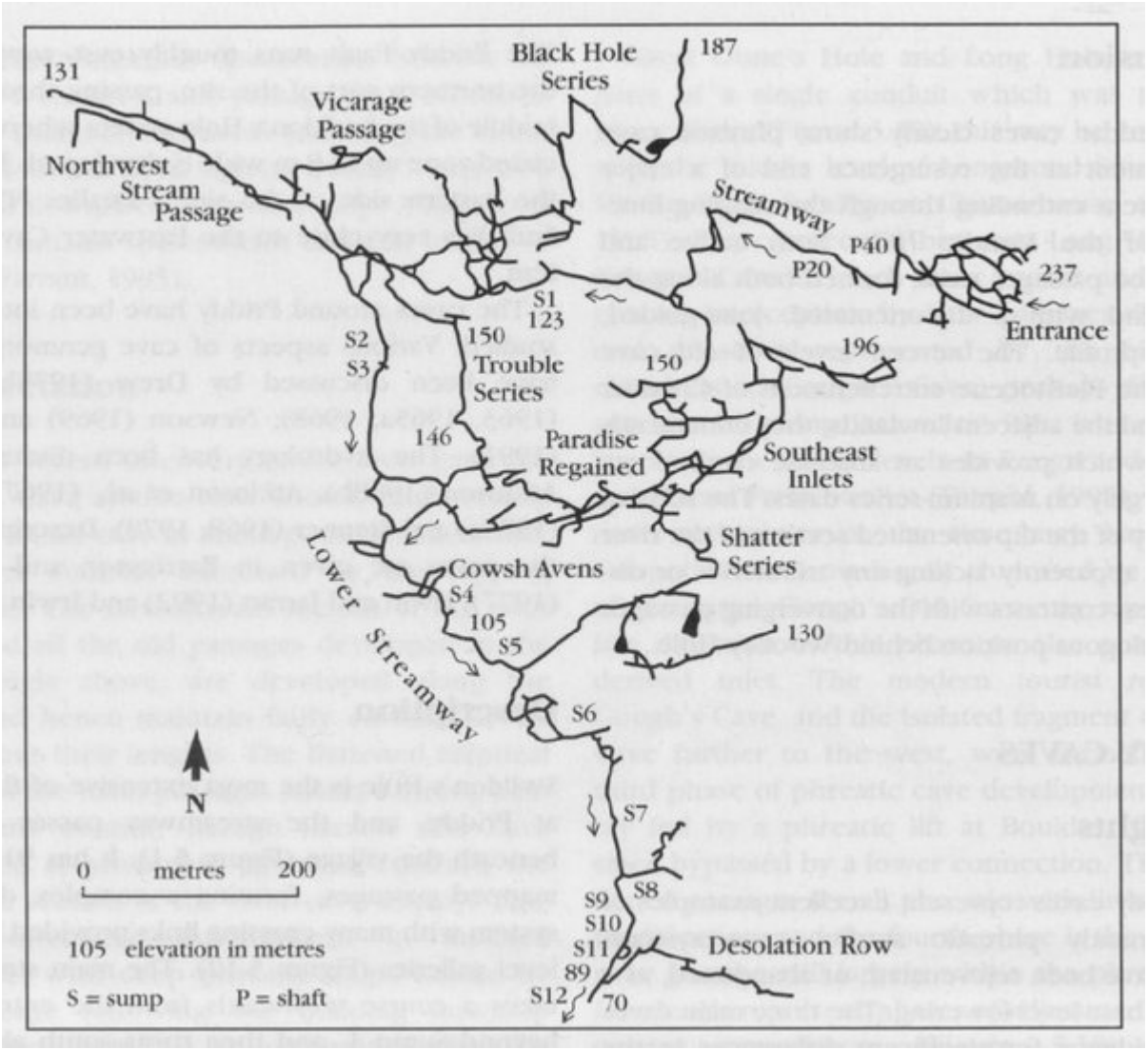
(Figure 5.9) Cheddar Gorge, looking upstream from the northern rim opposite High Rock. The limestone dips to the right, ensuring the stability of the cliffs on the right, while the left slope is cut back almost to the dip of the bedding planes. (Photo: A.C. Waltham.)



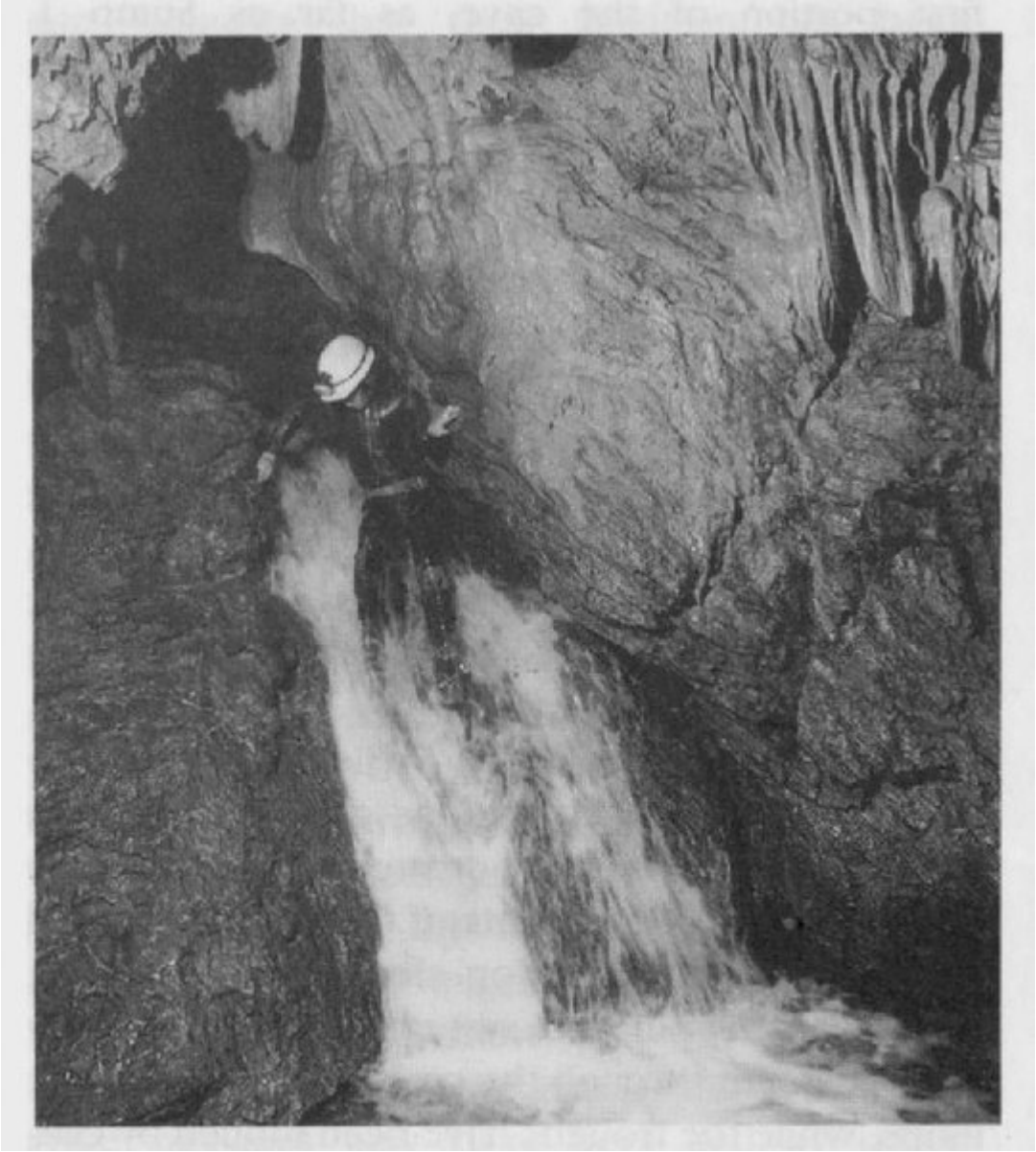
(Figure 5.10) Long profile of Cheddar Gorge up into the Longwood Valley, with the caves beneath. Each palaeo-water table is recognized from cave and surface morphology, and is dated from the sediments in associated cave passages at both the swallet and resurgence ends of the system. The water tables steepen greatly in the sandstone and shale, but are marked beyond the limestone only to label the caves in which each is recorded (G = GB Cave; L = Longwood Swallet; M = Manor Farm Swallet; R = Rhino Rift). The horizontal scale is distorted by the projection, and the vertical scale is exaggerated three times (largely after Stanton, 1985; Farrant, 1995).



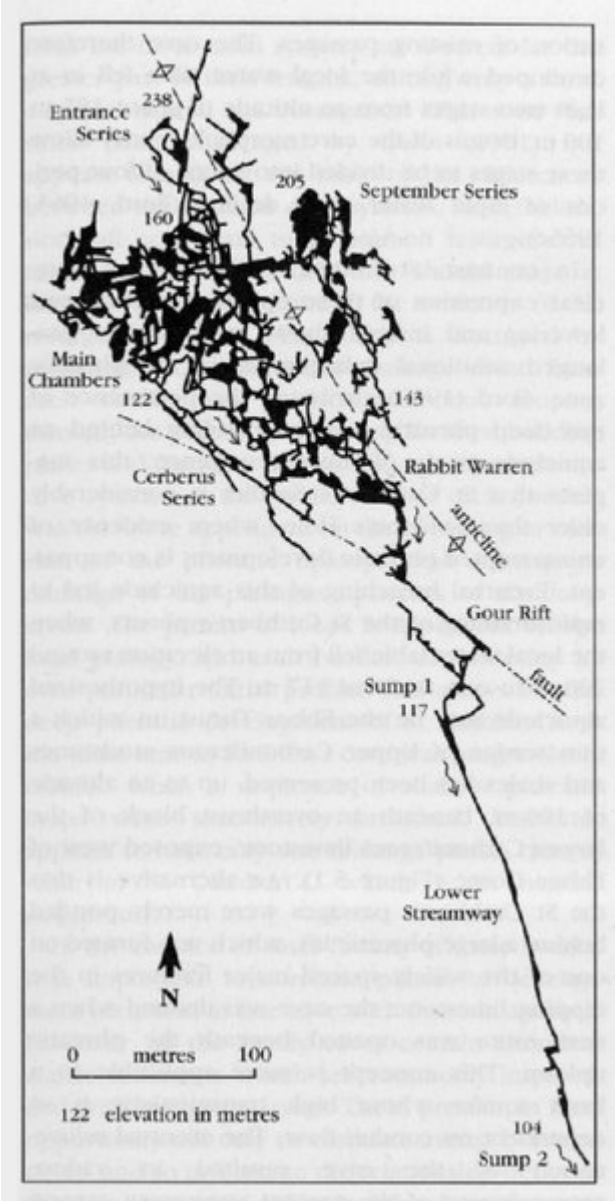
(Figure 5.11) Outline map of Gough's Cave, Cheddar. Long Hole and Great Oone's Hole lie partly over the show cave section and are omitted for clarity (from surveys by Wessex Cave Club and Cave Diving Group).



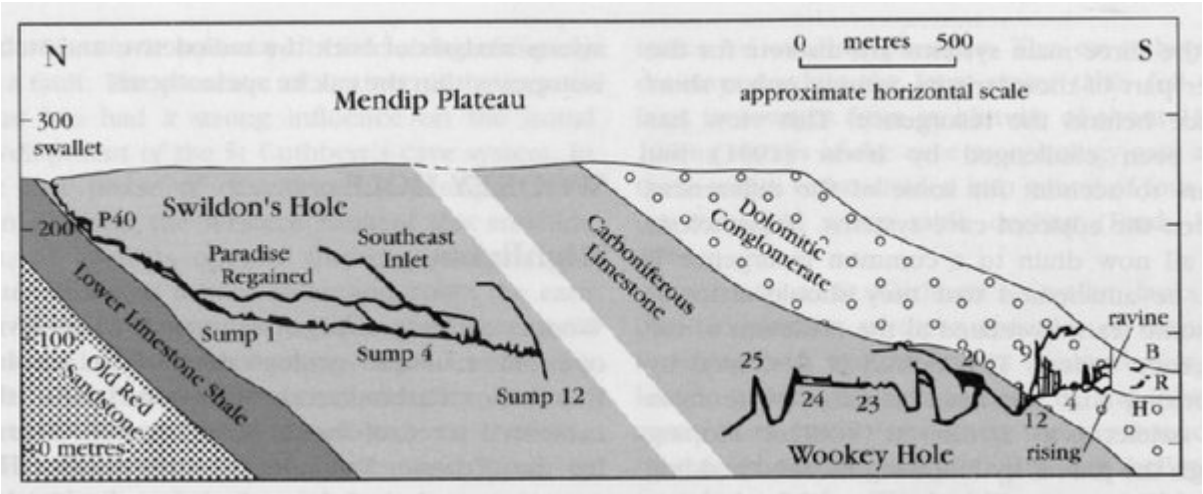
(Figure 5.12) Outline map of Swildon's Hole (from survey by Wessex Cave Club).



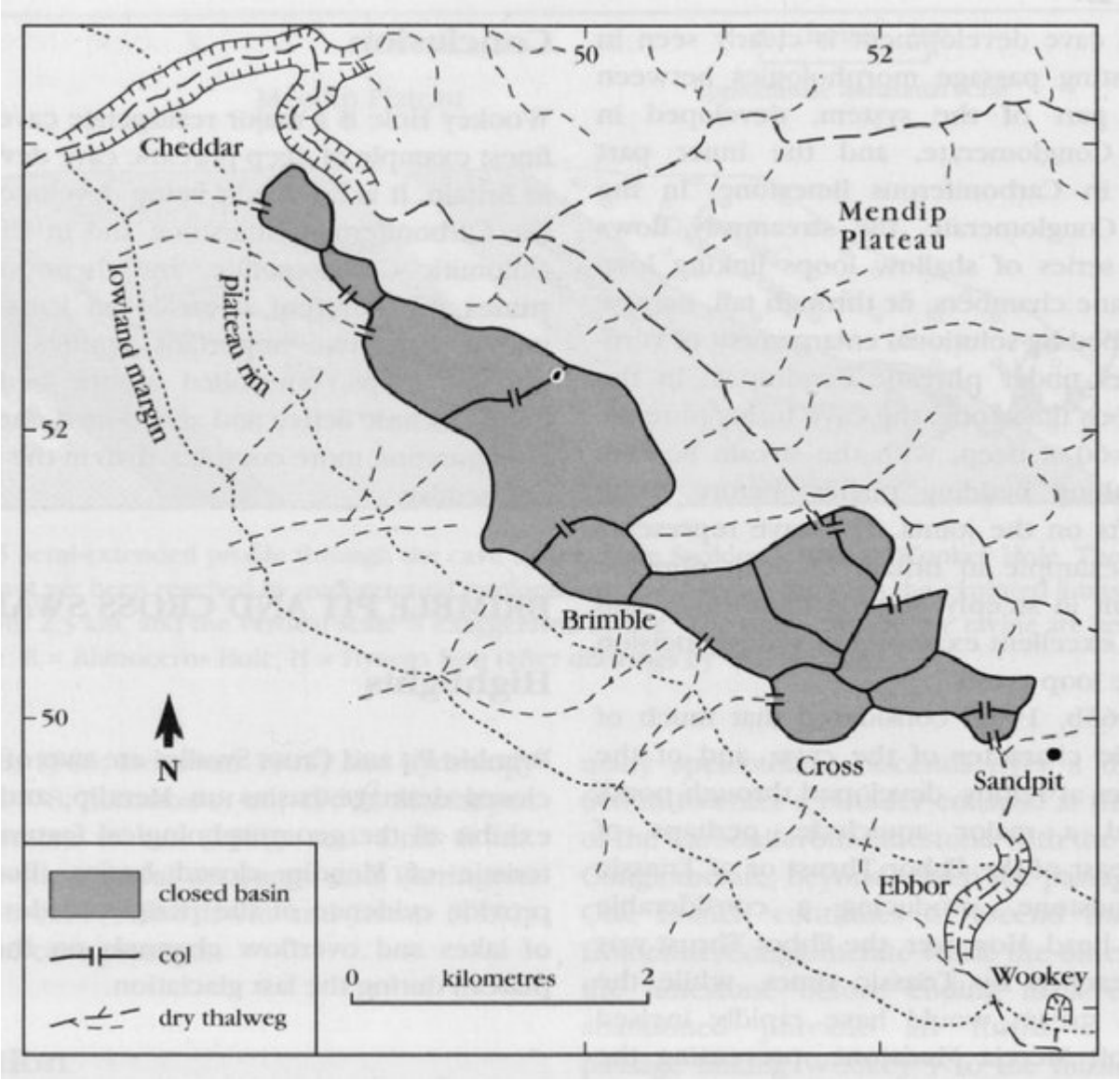
(Figure 5.13) The cascading streamway in thinly bedded Black Rock Limestone in Swildon's Hole. (Photo: J.R. Wooldridge.)



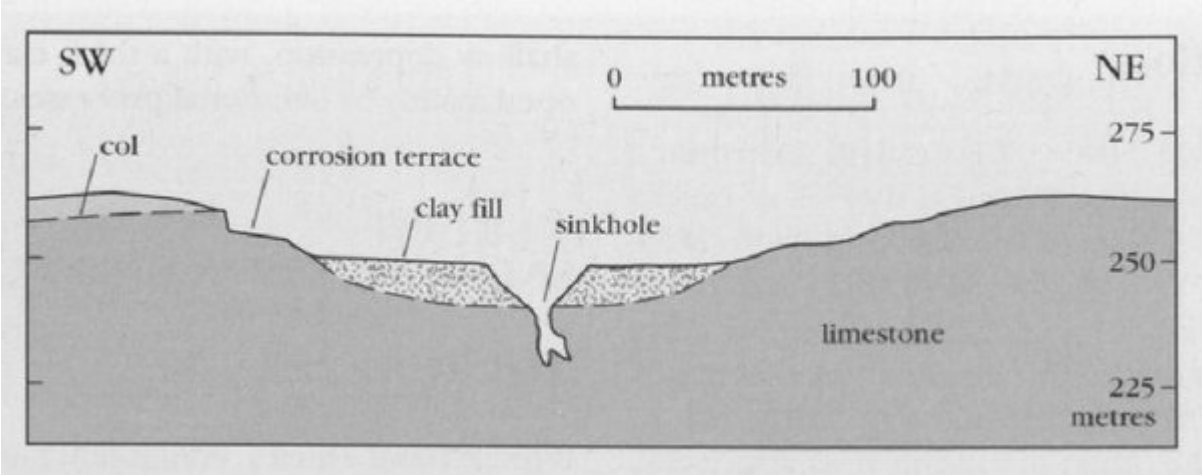
(Figure 5.14) Outline map of St Cuthbert's Swallet (from survey by Bristol Exploration Club).



(Figure 5.15) Semi-extended profile through the cave system from Swildon's Hole to Wookey Hole. The gap in the middle has not yet been reached by underground explorations; the distance between the explored limits of the two caves is about 2.3 km, and the vertical scale is exaggerated by five. The small caves in the ravine are keyed as: B = Badger Hole; R = Rhinoceros Hole; H = Hyaena Den (after drawings by W.I. Stanton).

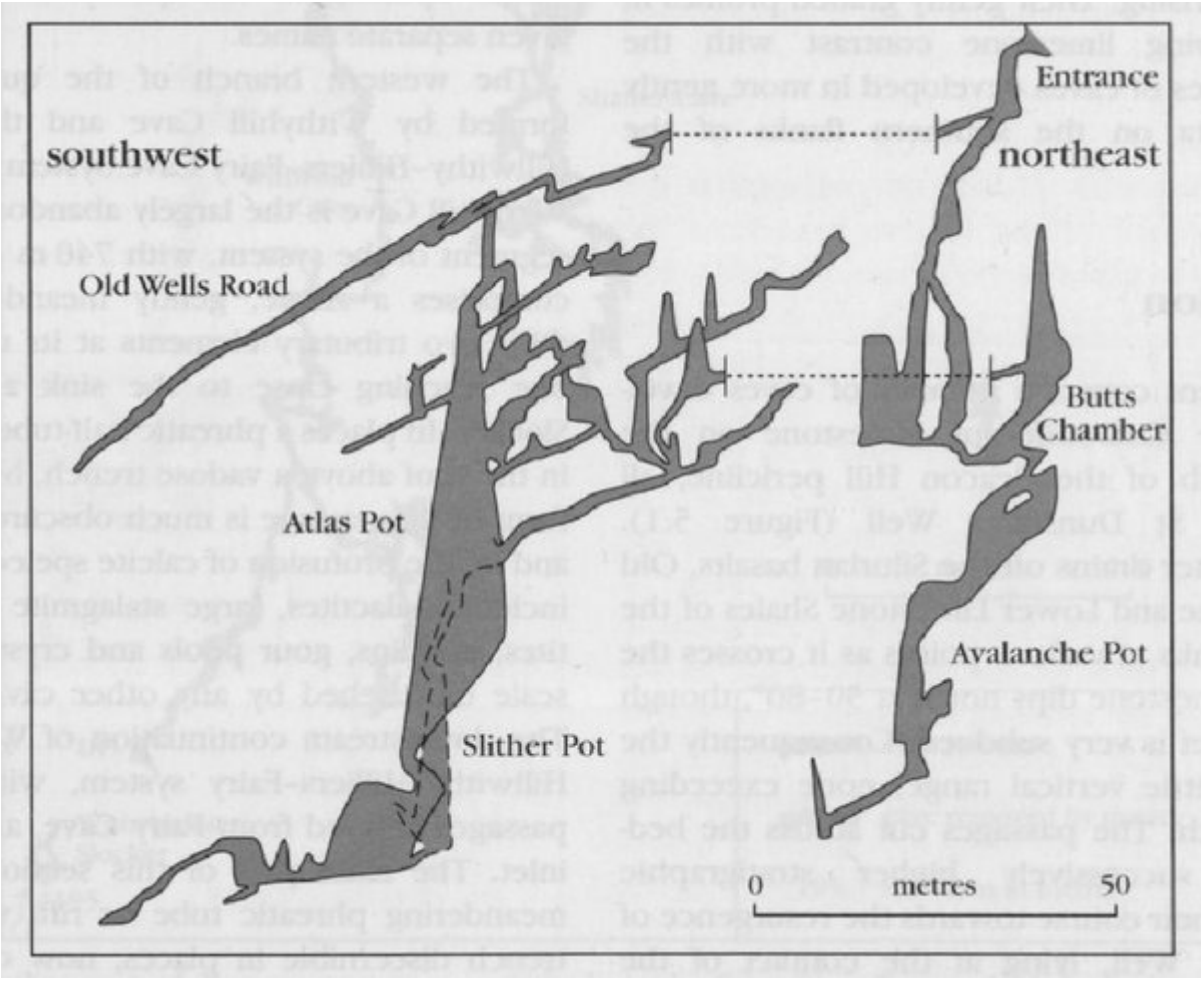


(Figure 5.16) Topographic map of the group of closed depressions forming the zone of polygonal karst on the edge of the Mendip Plateau (after Ford and Stanton, 1968).

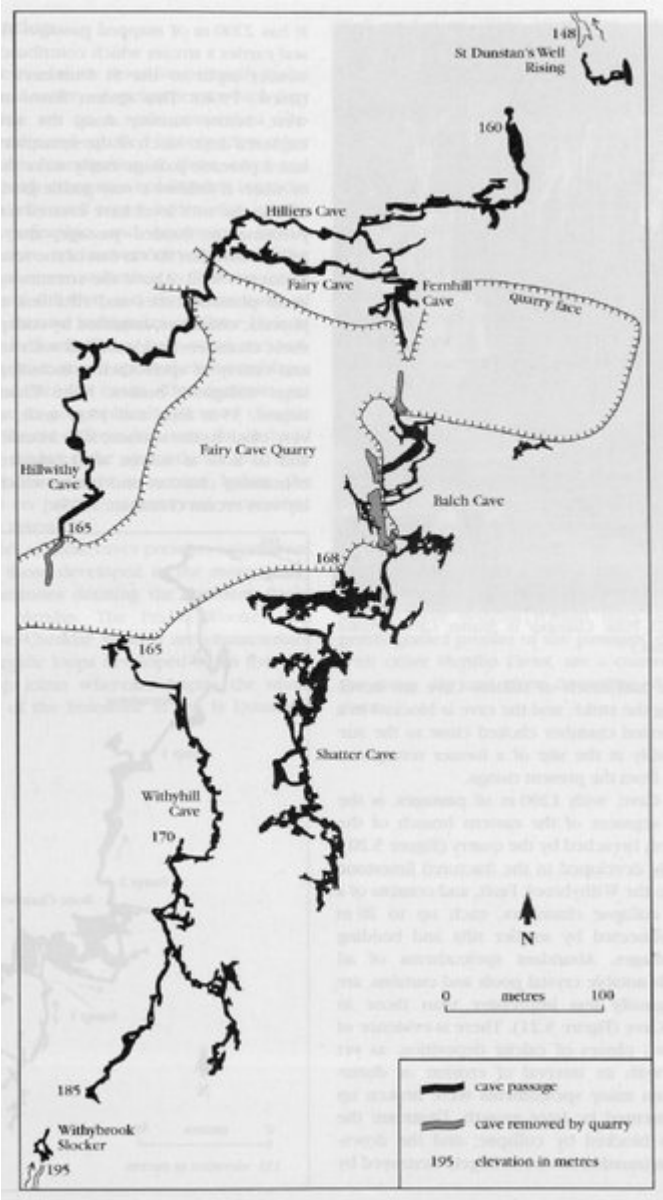


(Figure 5.17) Cross-section through the depression and sinkhole of Cross Swallet (after Ford and Stanton, 1968).

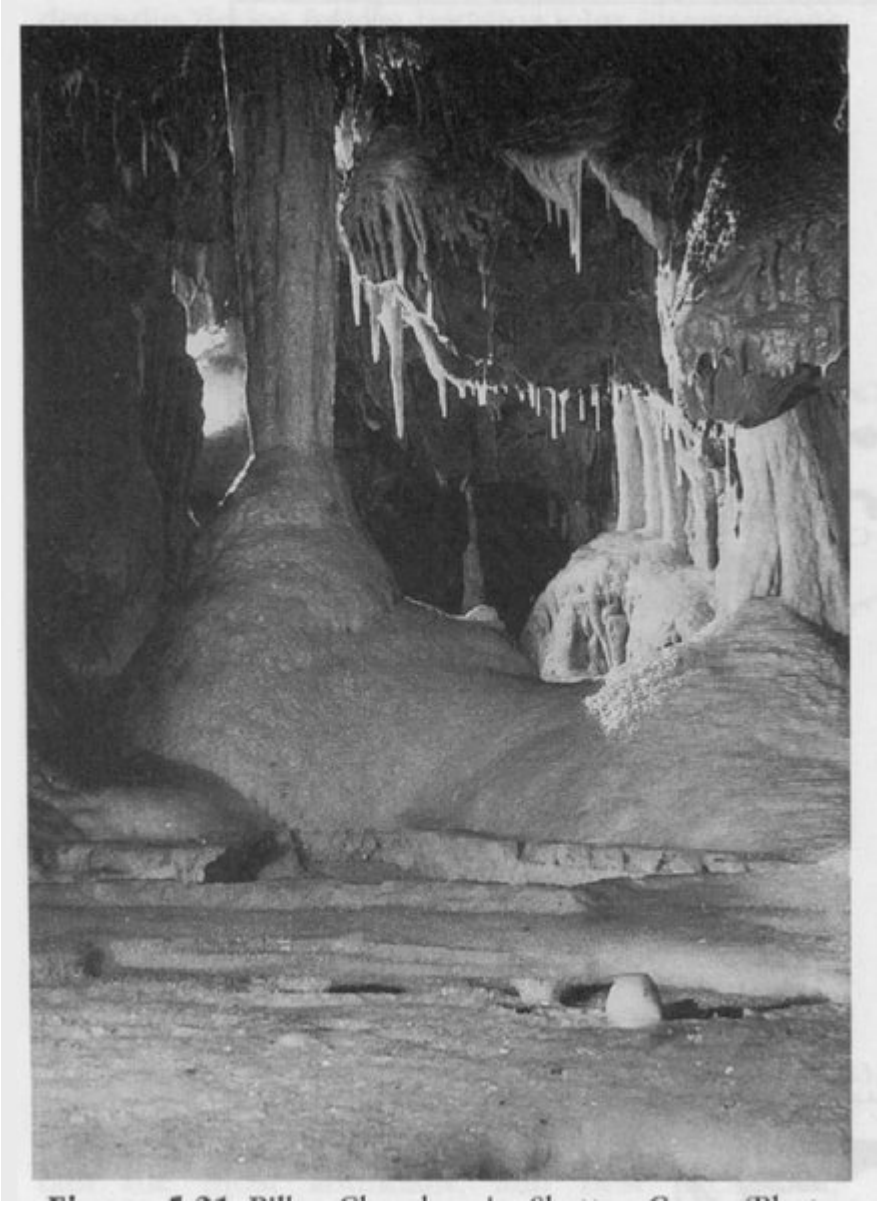
(Figure 5.18) The Wurt Pit doline breaks the gently graded surface on the Harptree Beds outcrop. (Photo: A.C. Waltham.)



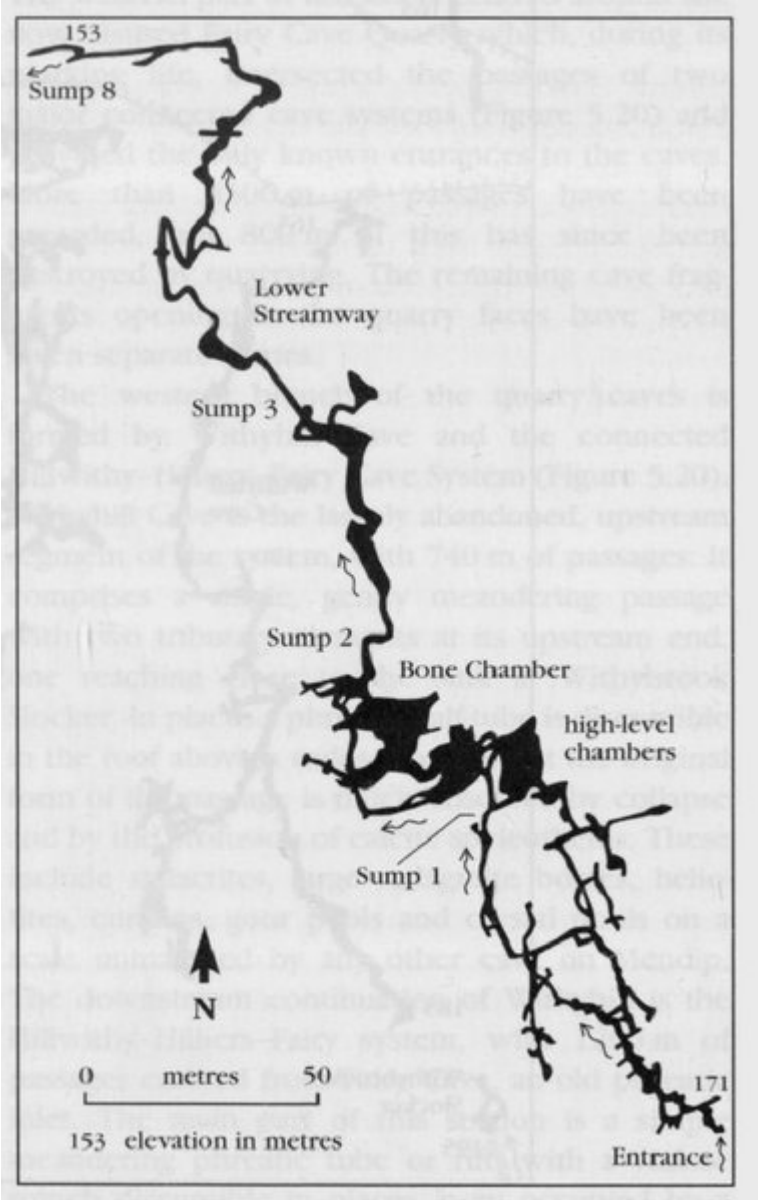
(Figure 5.19) Projected profile through Thrupe Lane Swallet (from survey by Mendip Nature Research Committee).



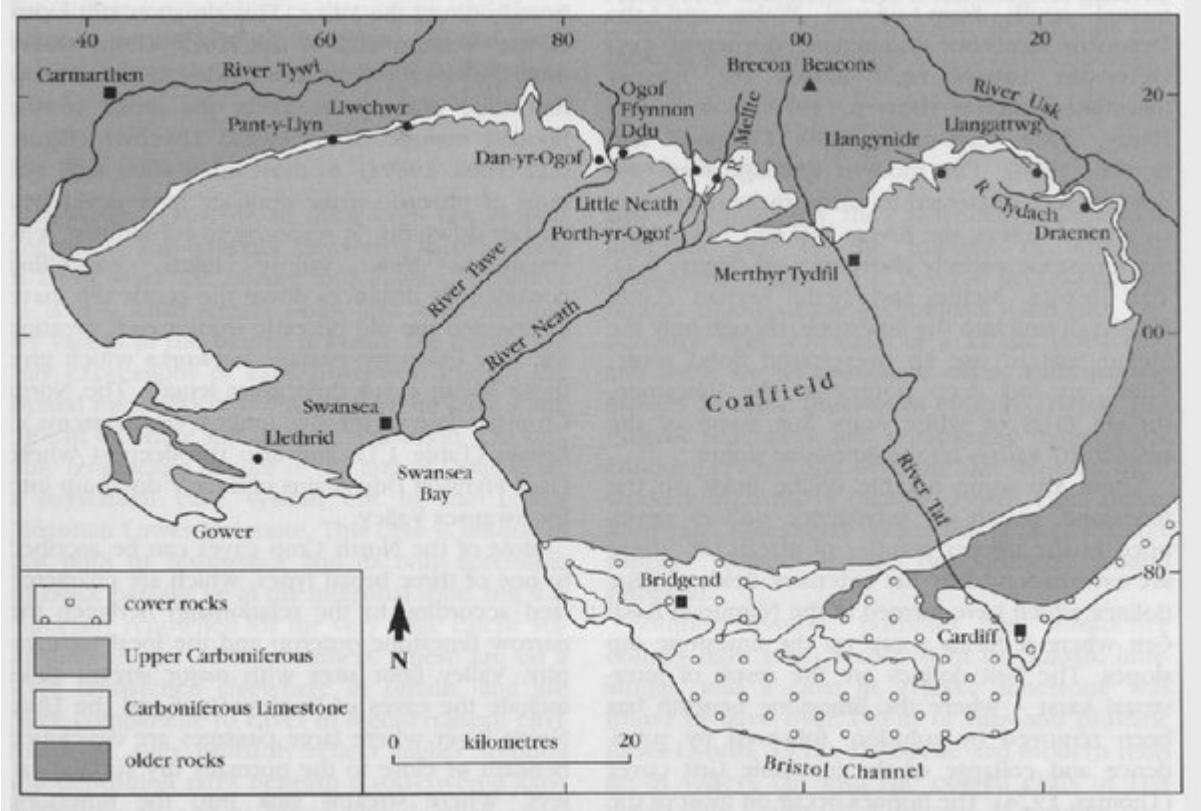
(Figure 5.20) Outline map of the cave systems revealed where the Fairy Cave Quarry cut into the limestone outcrop (from survey by Cerberus Caving Club).



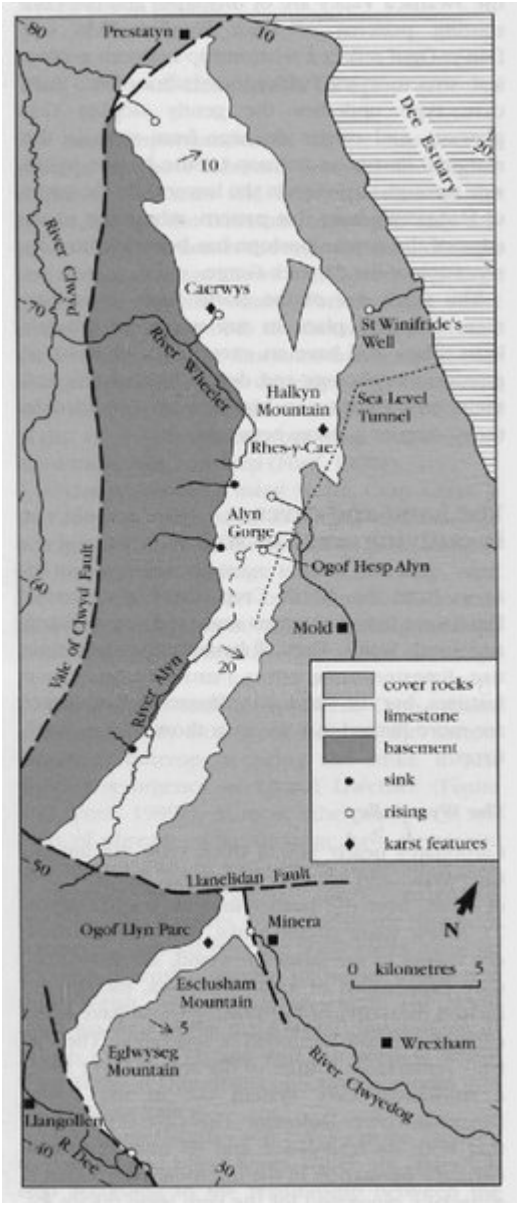
(Figure 5.21) Pillar Chamber in Shatter Cave. (Photo: A.C. Waltham.)



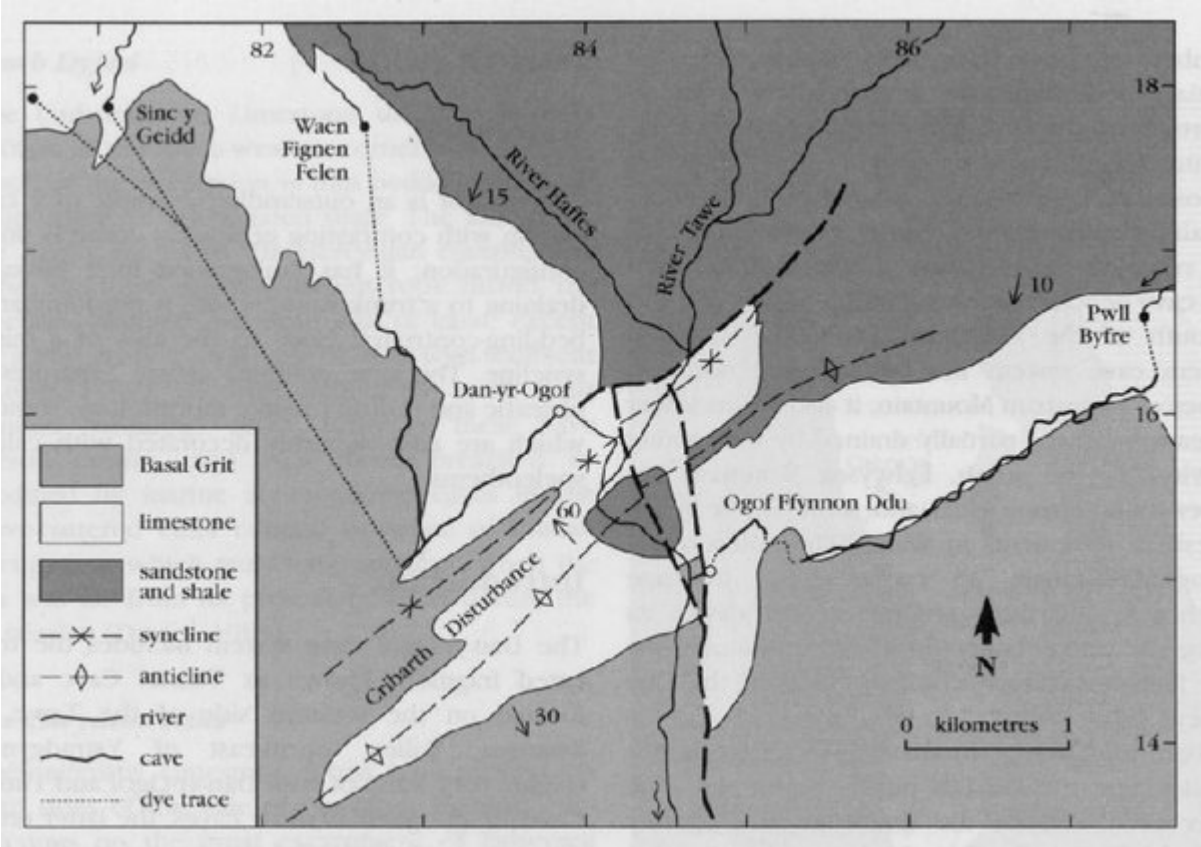
(Figure 5.22) Outline map of Stoke Lane Slocker (from surveys by Wessex Cave Club and Cave Diving Group).



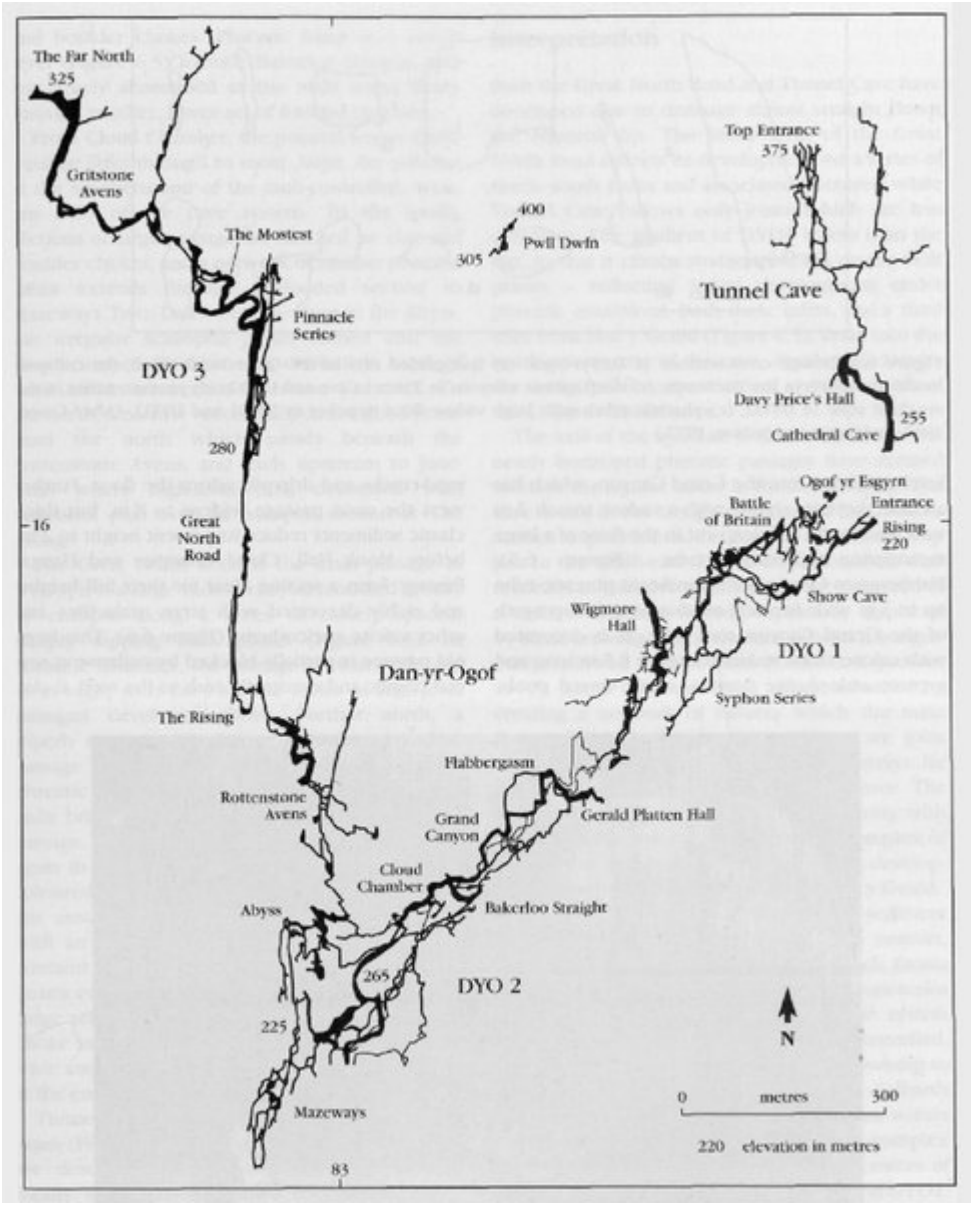
(Figure 6.1) Outline map of the karst areas around the perimeter of the South Wales coalfield, with locations referred to in the text. The cover rocks in the south are Triassic and Jurassic mudstones and thin limestones.



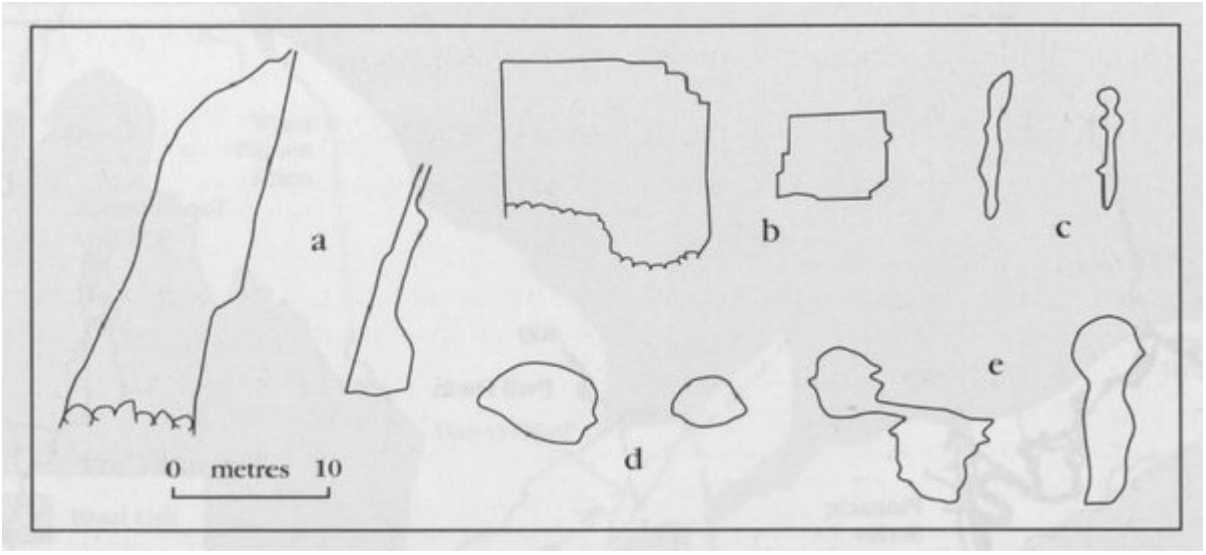
(Figure 6.2) Outline map of karst features in the Carboniferous Limestone of eastern Clwyd, North Wales, with locations referred to in the text. The main rivers and risings are shown as they were before disturbance by the mine drainage. The basement is Ordovician shale; the cover rocks are Upper Carboniferous and Triassic clastics. Many of the steps on the boundaries are due to minor faults.



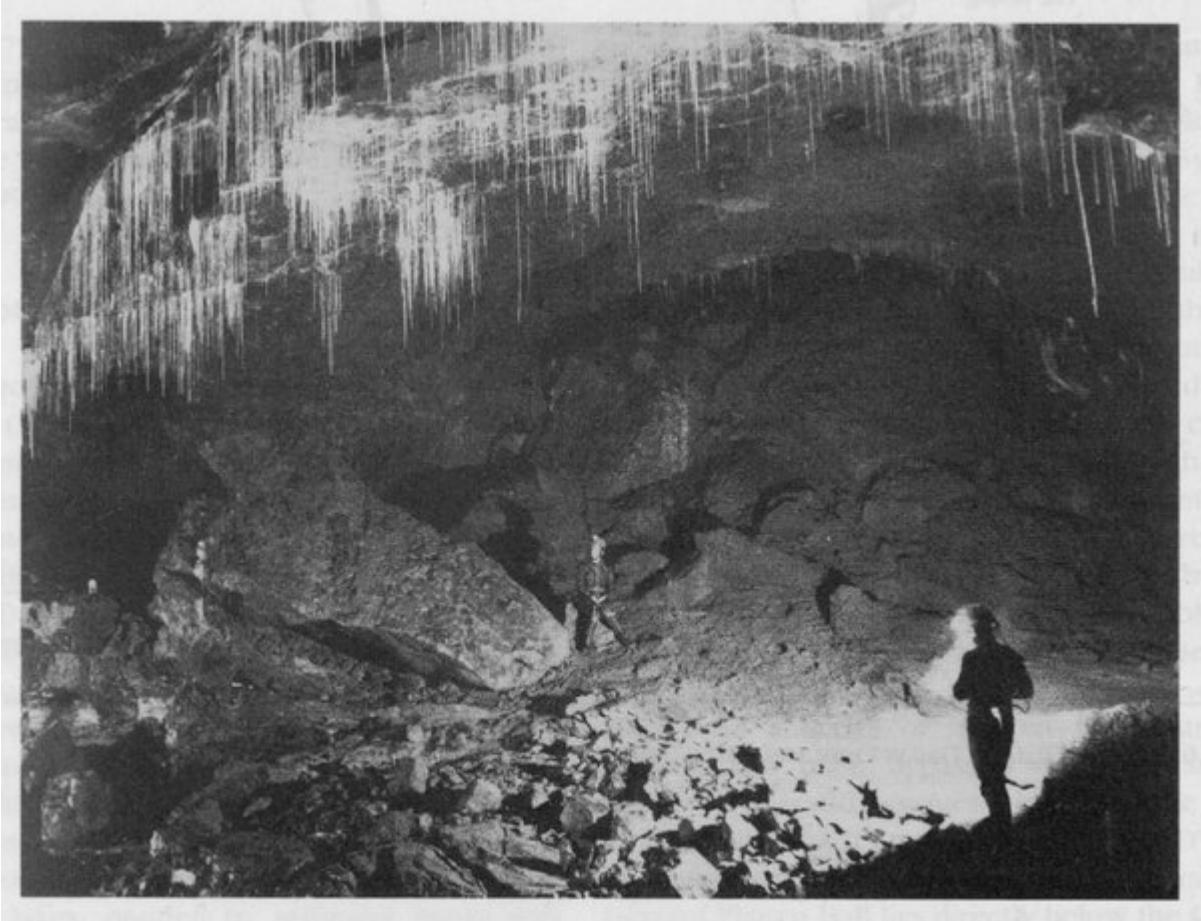
(Figure 6.3) Geological map of the North Crop of the Carboniferous Limestone where it is crossed by the River Tawe in the Swansea Valley. Many small faults are omitted to improve clarity. The sandstones and shales below the limestone are mainly Devonian but include the Lower Limestone Shale from the Carboniferous. The only caves marked are the main stream passages in Dan-yr-Ogof and Ogof Ffynnon Ddu.



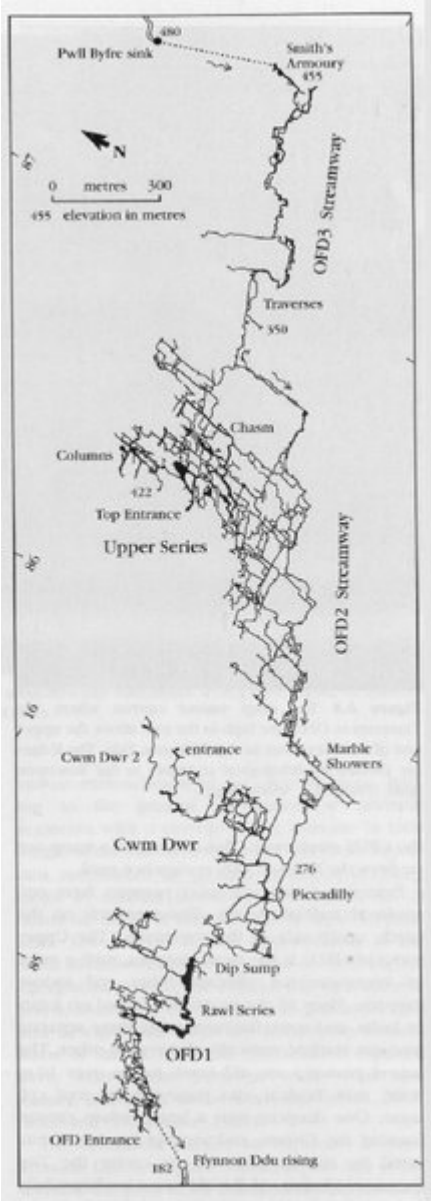
(Figure 6.4) Outline map of Dan-yr-Ogof and Cathedral Cave (from survey by South Wales Caving Club).



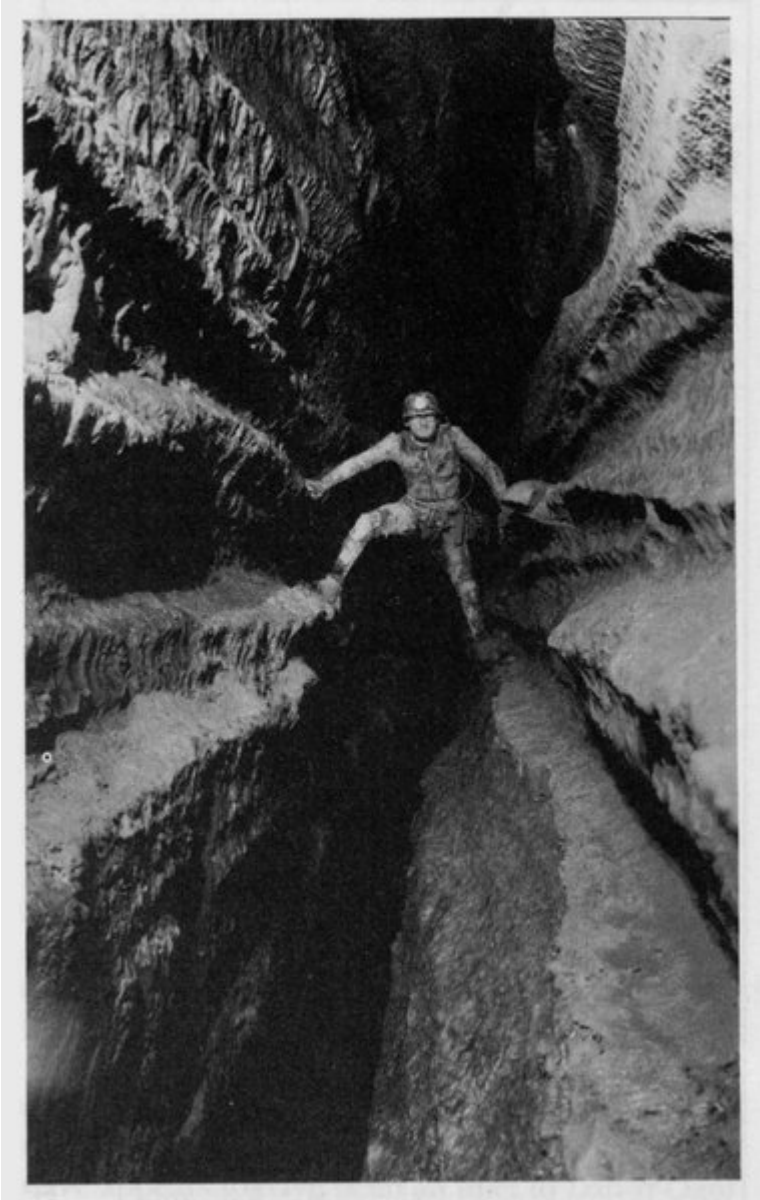
(Figure 6.5) Passage cross-sections in Dan-yr-Ogof: (a) fault-guided rifts in the Great North Road; (b) collapse-modified tunnels in the Far North; (c) deep vadose canyons in Tunnel Cave and DYO2; (d) phreatic tubes in the synclinal zone of DYO2; (e) phreatic tubes with large vadose floor trenches in DYO1 and DYO2. (After Coase, 1967, and Coase and Judson, 1977.)



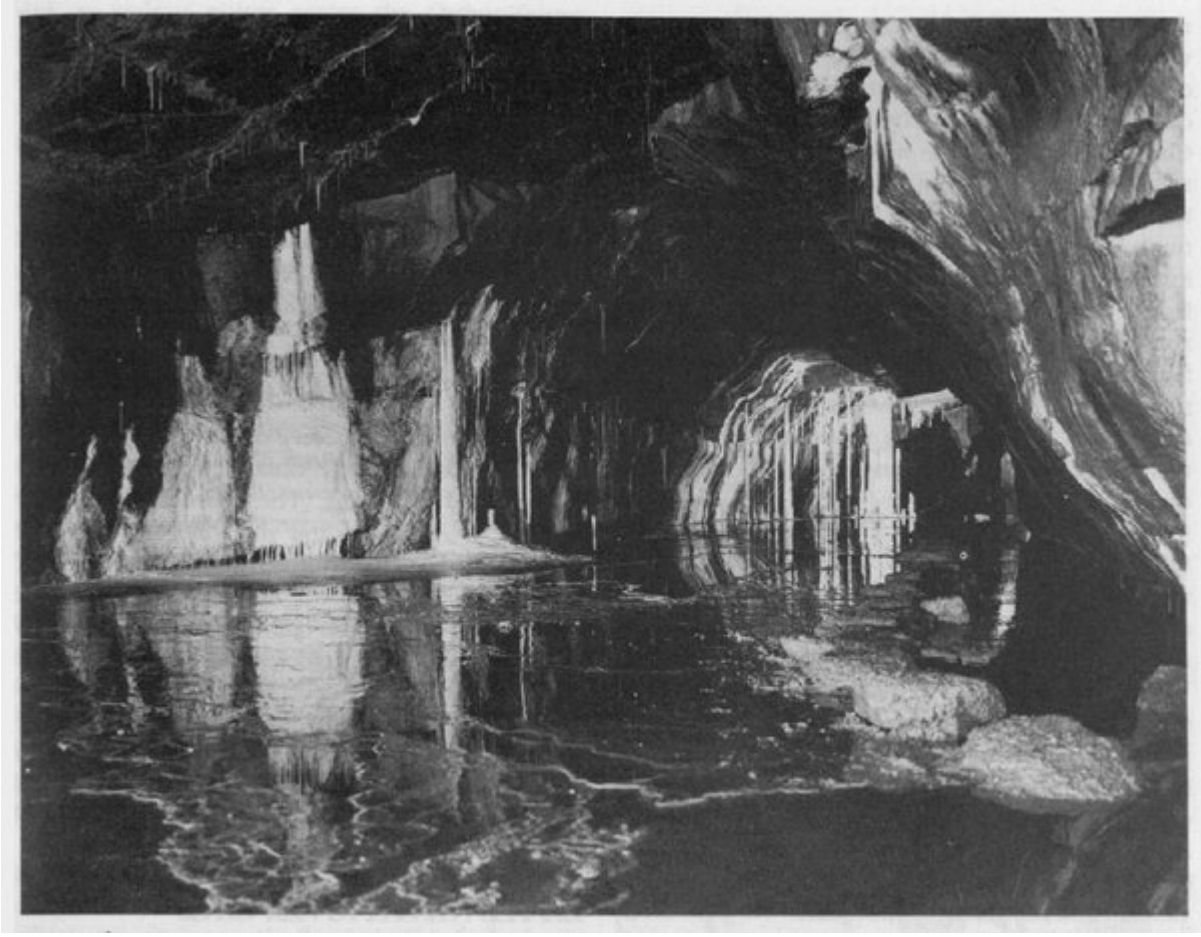
(Figure 6.6) Calcite straw stalactites hang from the arched phreatic roof of Cloud Camber in Dan-yr-Ogof. (Photo: J.R. Wooldridge.)



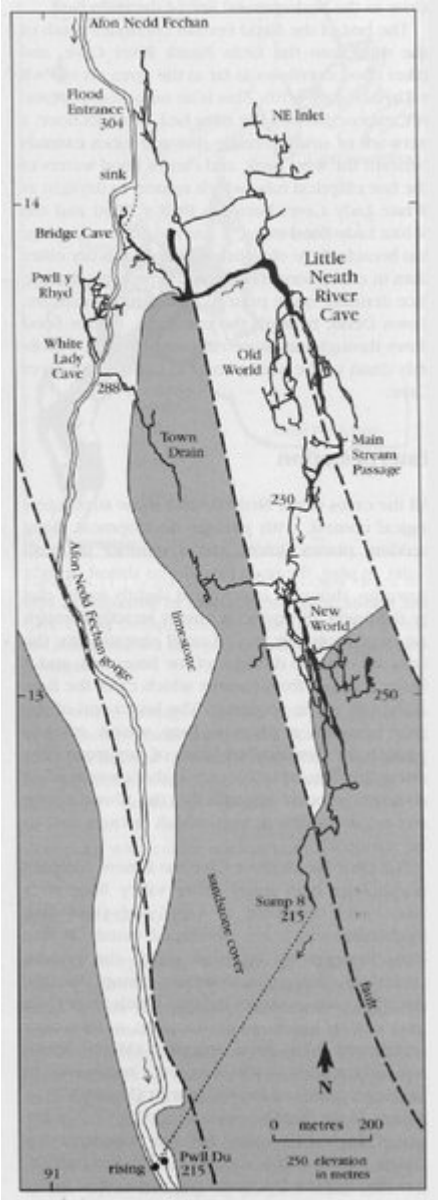
(Figure 6.7) Outline map of Ogof Ffynnon Ddu (from loop beneath the Rawl Series, until it emerges in survey by South Wales Caving Club).



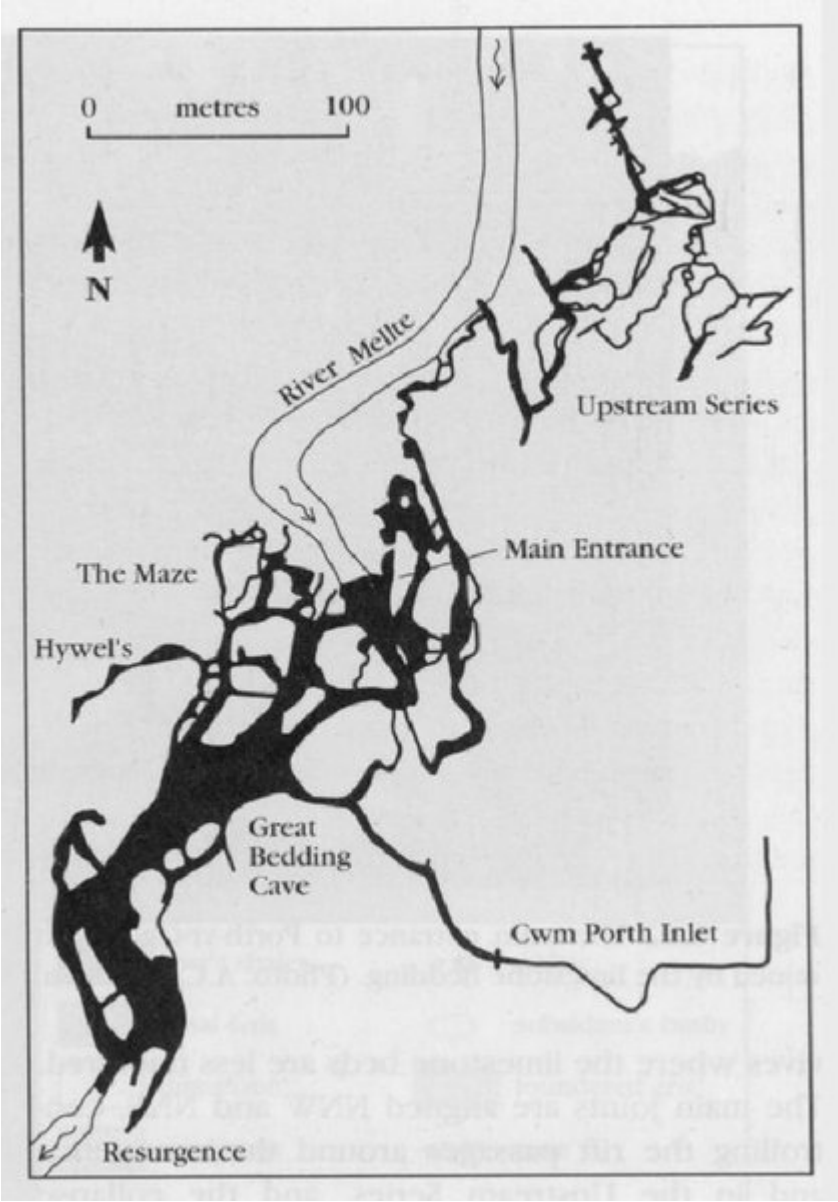
(Figure 6.8) The deep vadose canyon where the Traverses in OFD3 are high in the roof above the upper end of the streamway in Ogof Ffynnon Ddu. The ledges are created by lithological contrasts in the limestone beds. (Photo: J.R. Wooldridge.)



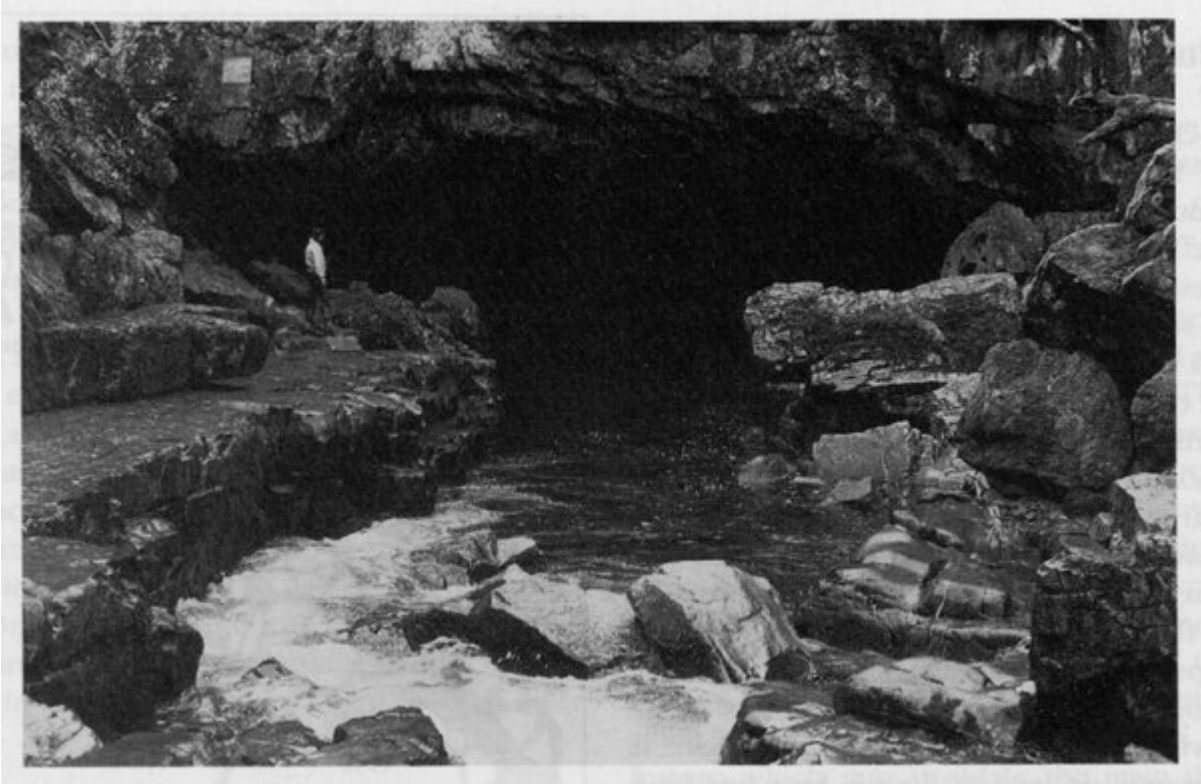
(Figure 6.9) The Columns in Ogof Ffynnon Ddu — calcite stalactites and stalagmites which have grown to connection in a fossil phreatic tube. (Photo: South Wales Caving Club.)



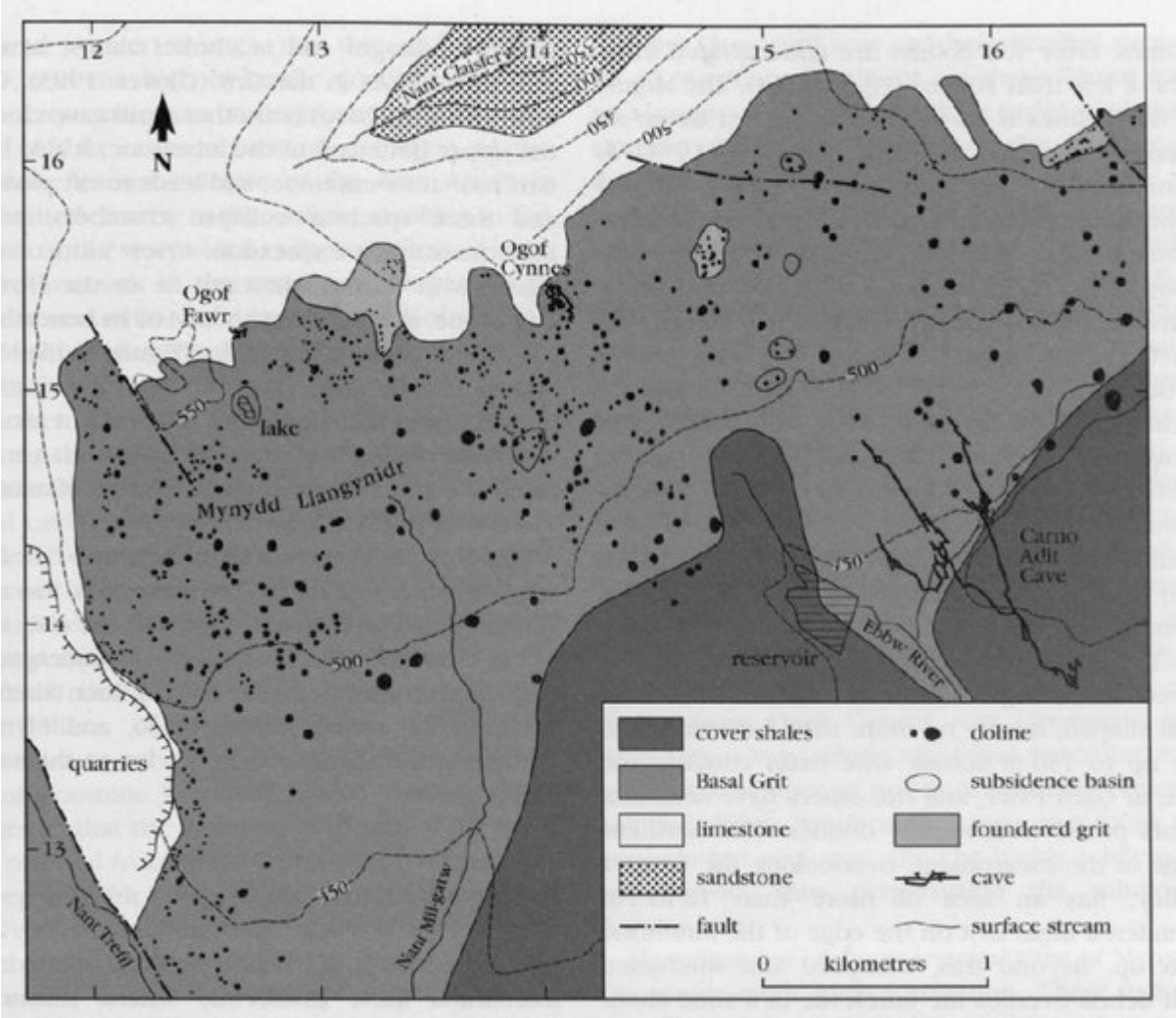
(Figure 6.10) Outline map of the Little Neath River Cave, its surface geology and the adjacent caves of Pwll y Rhyd (from survey by University of Bristol Speleological Society).



(Figure 6.11) Outline map of Porth-yr-Ogof (from surveys by University of Bristol Speleological Society and Cave Diving Group). The dry valley between the sink and resurgence lies almost directly over the largest cave passages.

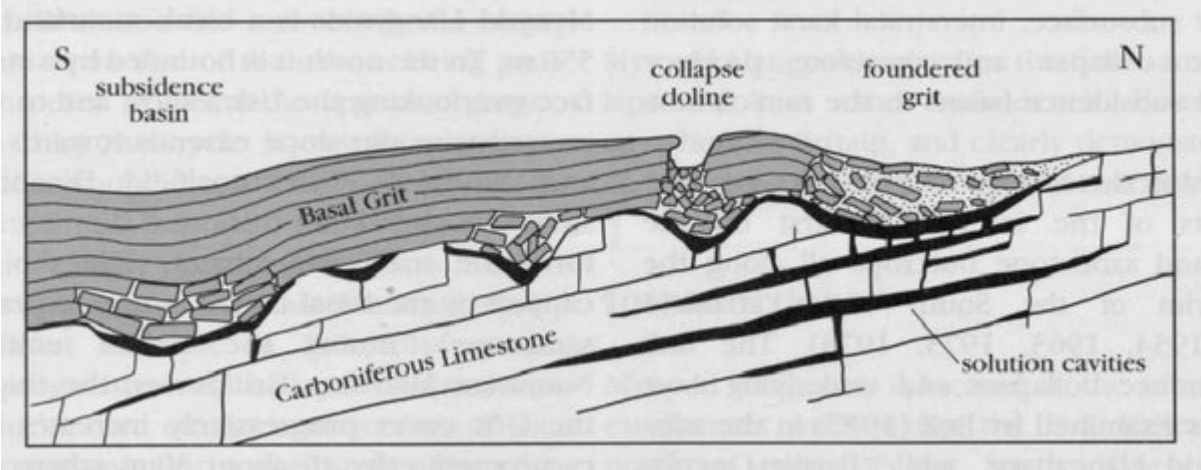


(Figure 6.12) The main entrance to Porth-yr-Ogof with the River Mellte flowing in between rock terraces determined by the limestone bedding. (Photo: A.C. Waltham.)

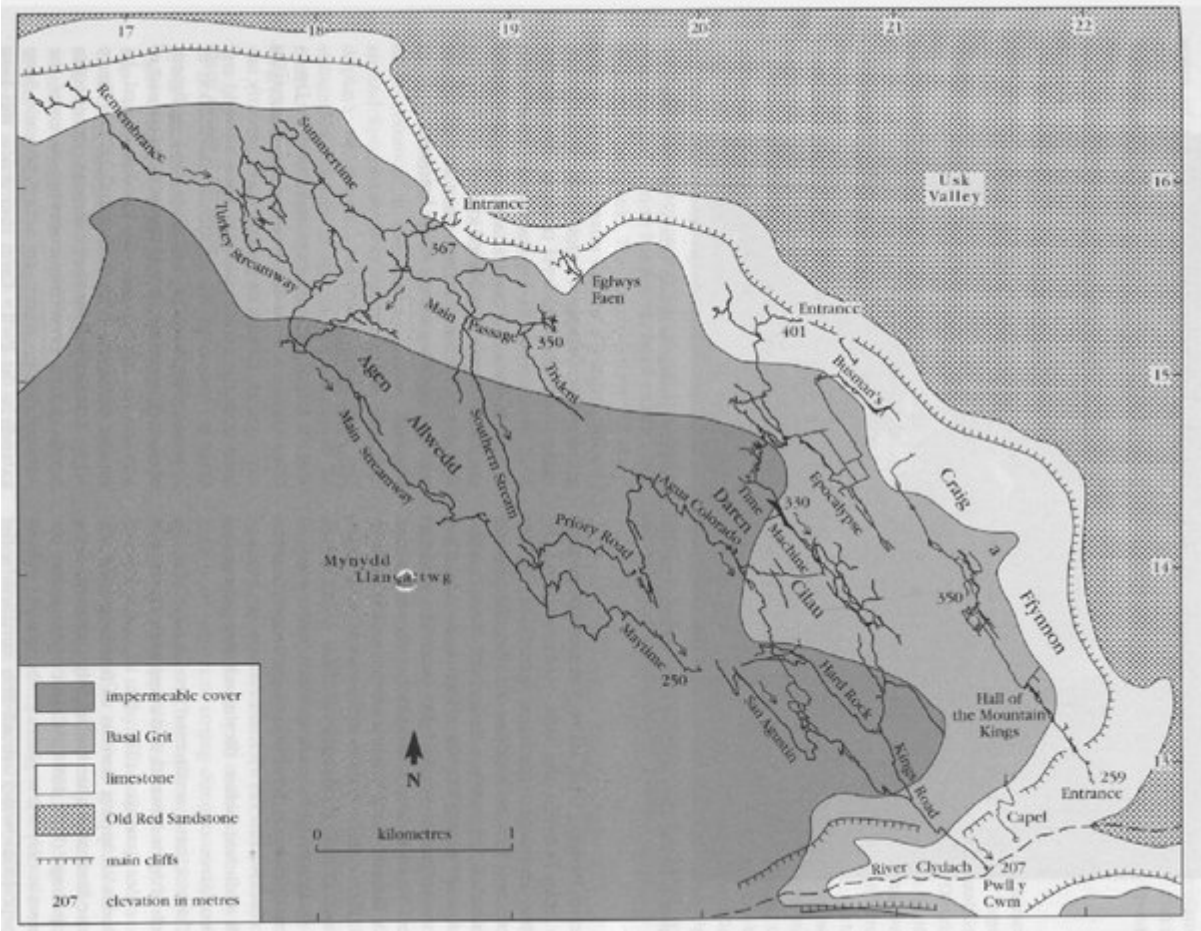


(Figure 6.13) Geological map of the doline field on Mynydd Llangynidr (partly after Thomas, 1974: Ogof Carno from survey by Brynmawr Caving Club). The cover rocks are Namurian shales above the Basal Grit and Coal Measures. The

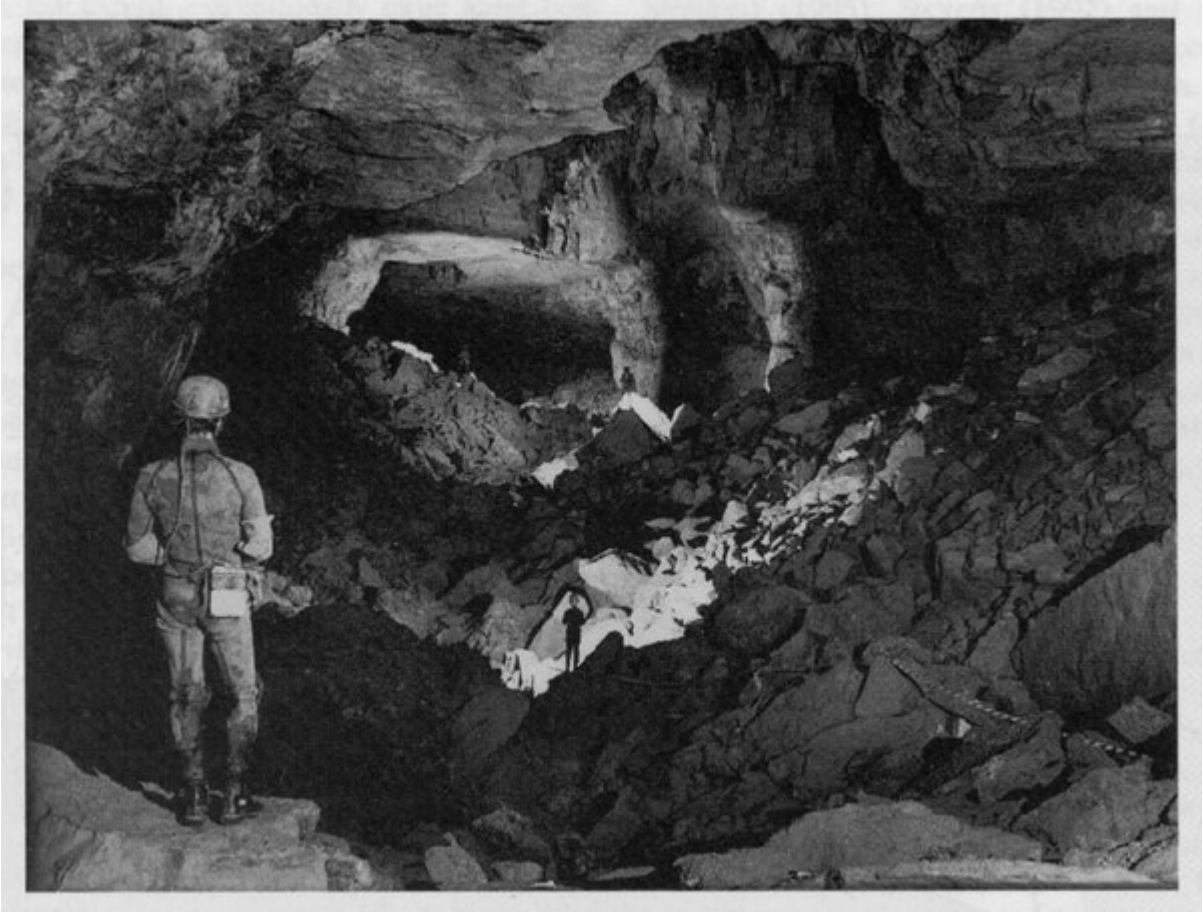
sandstone beneath the limestone is Devonian. Much of the limestone outcrop is covered by soliflucted Grit blocks.



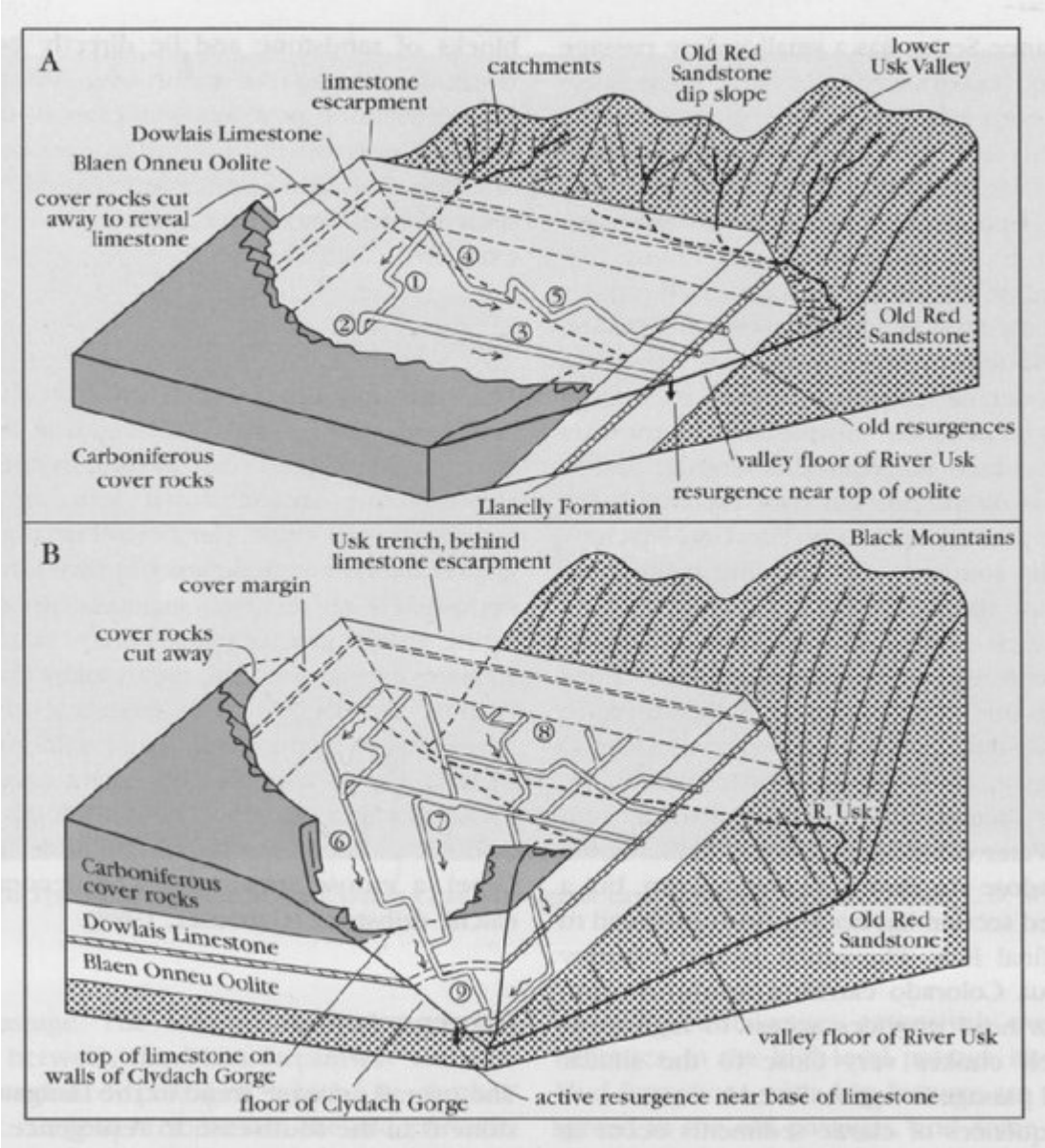
(Figure 6.14) Diagrammatic cross-section through the three types of surface depression formed in the Basal Grit due to solution of the limestone beneath (after Thomas, 1974).



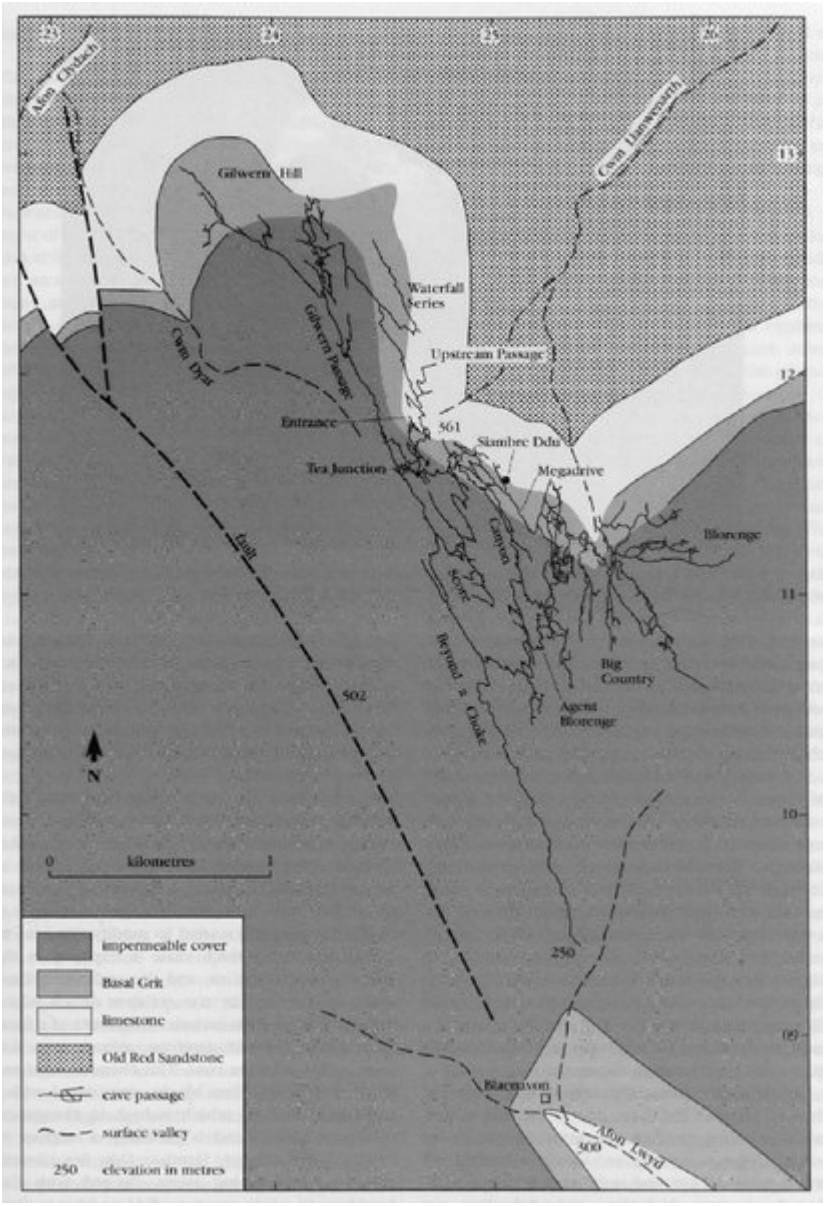
(Figure 6.15) Outline map of the caves under Mynydd Llangattwg (from surveys by Chelsea Speleological Society, British Speleological Association, Cwmbran Caving Club, Cave Diving Group and others).



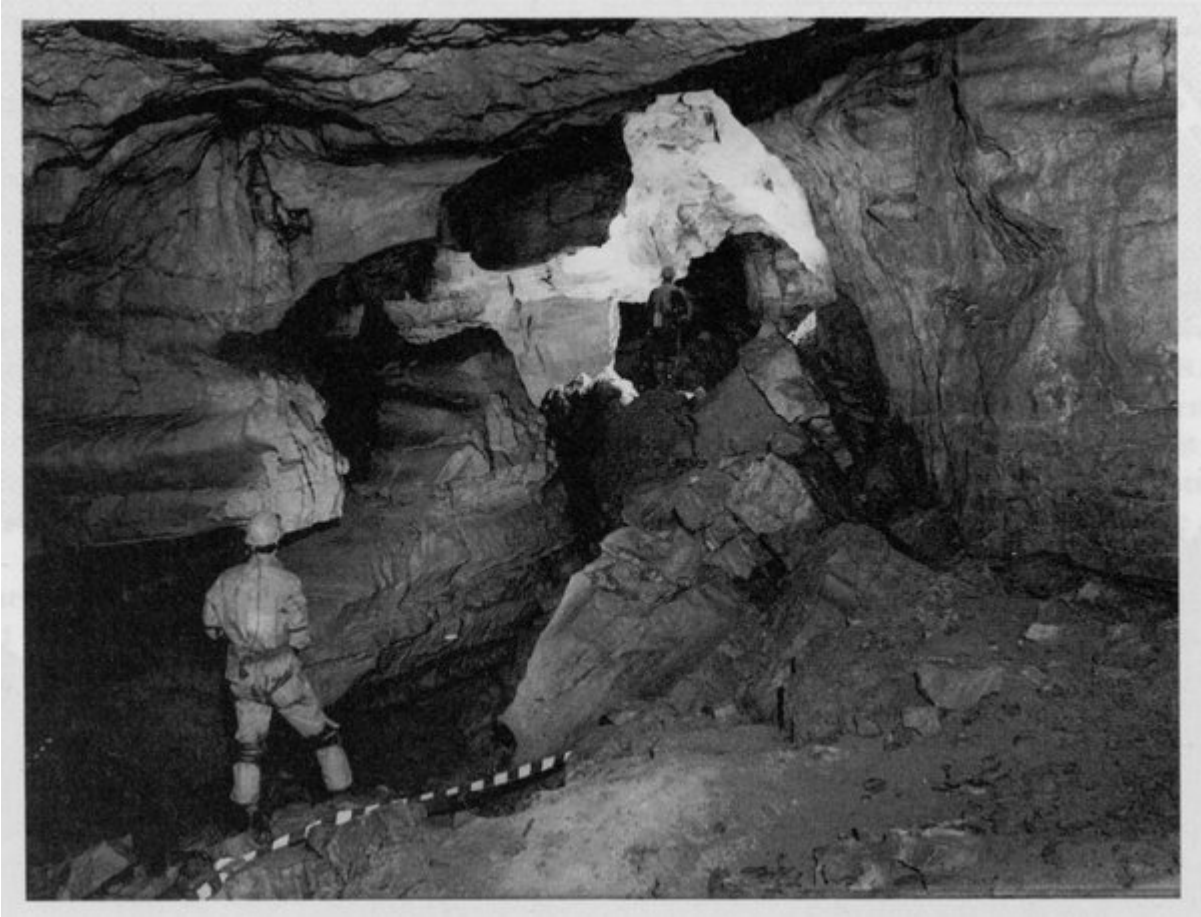
(Figure 6.16) The Time Machine in Ogof Daren Cilau, the largest cave passage in Britain. (Photo: C.D. Westlake.)



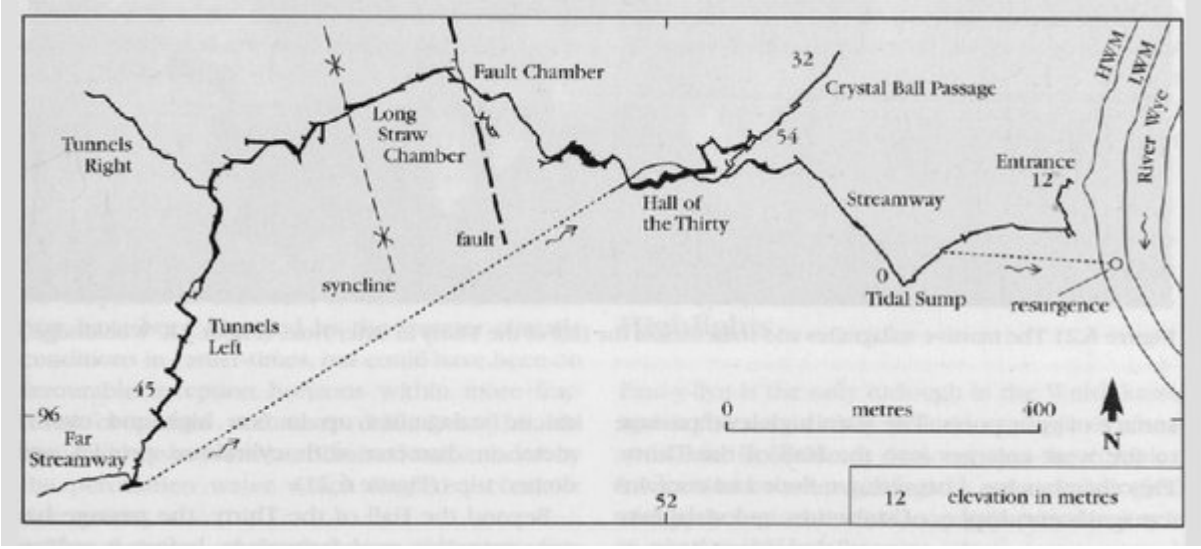
(Figure 6.17) Block diagrams showing stages in the evolution of the Llangattwg caves. (A) In the early stage, the Usk headwaters drain into the cave: 1 = vadose flow downdip; 2 = phreatic lift taking water from the base to near the top of the oolites; 3 = phreatic strike flow; 4 = vadose flow on joints; 5 = phreatic conduit looping along joints. (B) In the later stage, the limestone escarpment is perched above the Usk trench: 6 = main drainage on joints with greater downdip component; 7 = older passages invaded by vadose streams; 8 = vadose inlets from limestone outcrop and from glacier melt during Pleistocene; 9 = limited phreatic development behind resurgence. (After Smart and Gardener, 1989.)



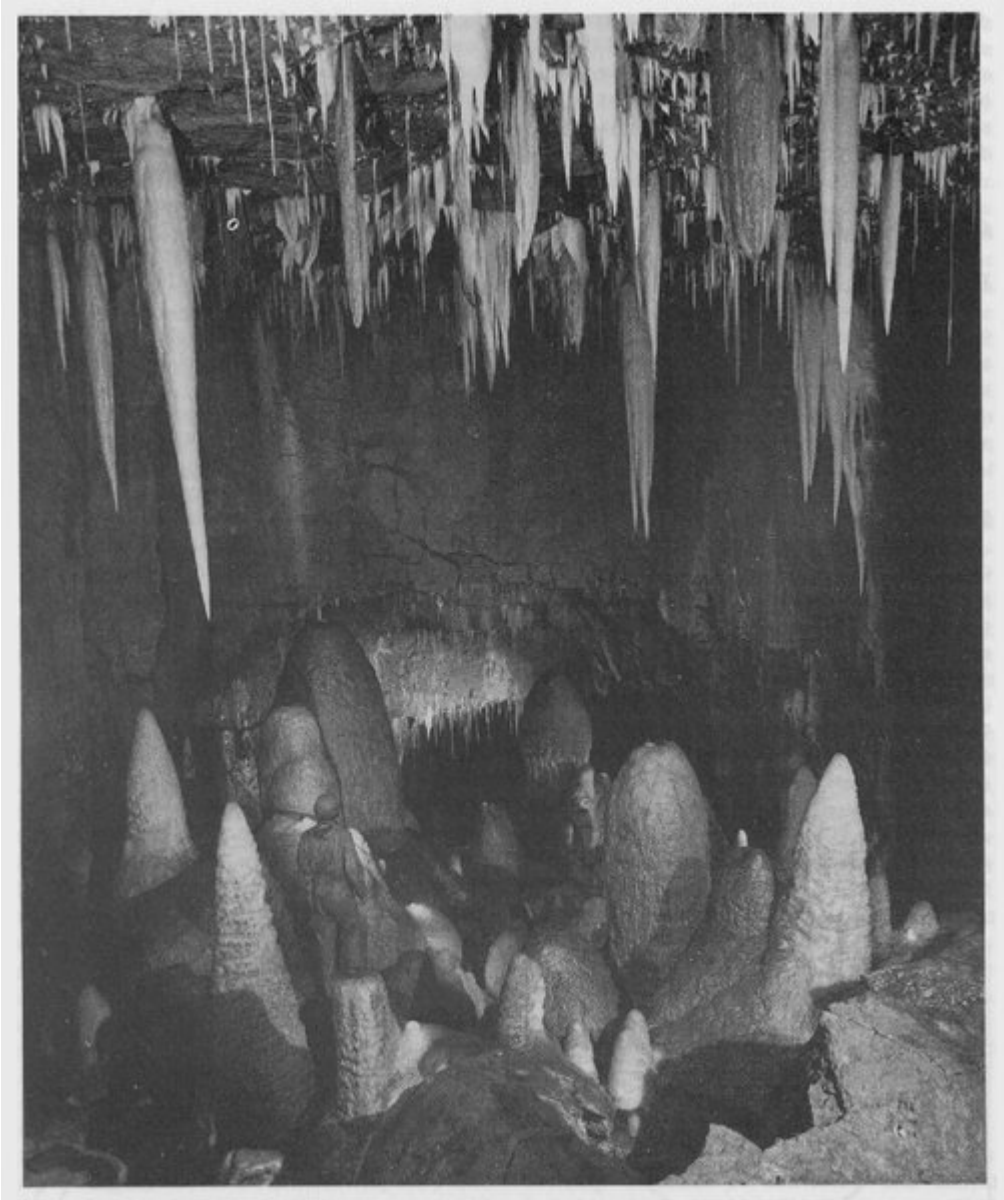
(Figure 6.18) Outline map of Ogof Draenen; this is only a centreline plot of the cave, with no indication of passage widths (from survey by Chelsea Speleological Society).



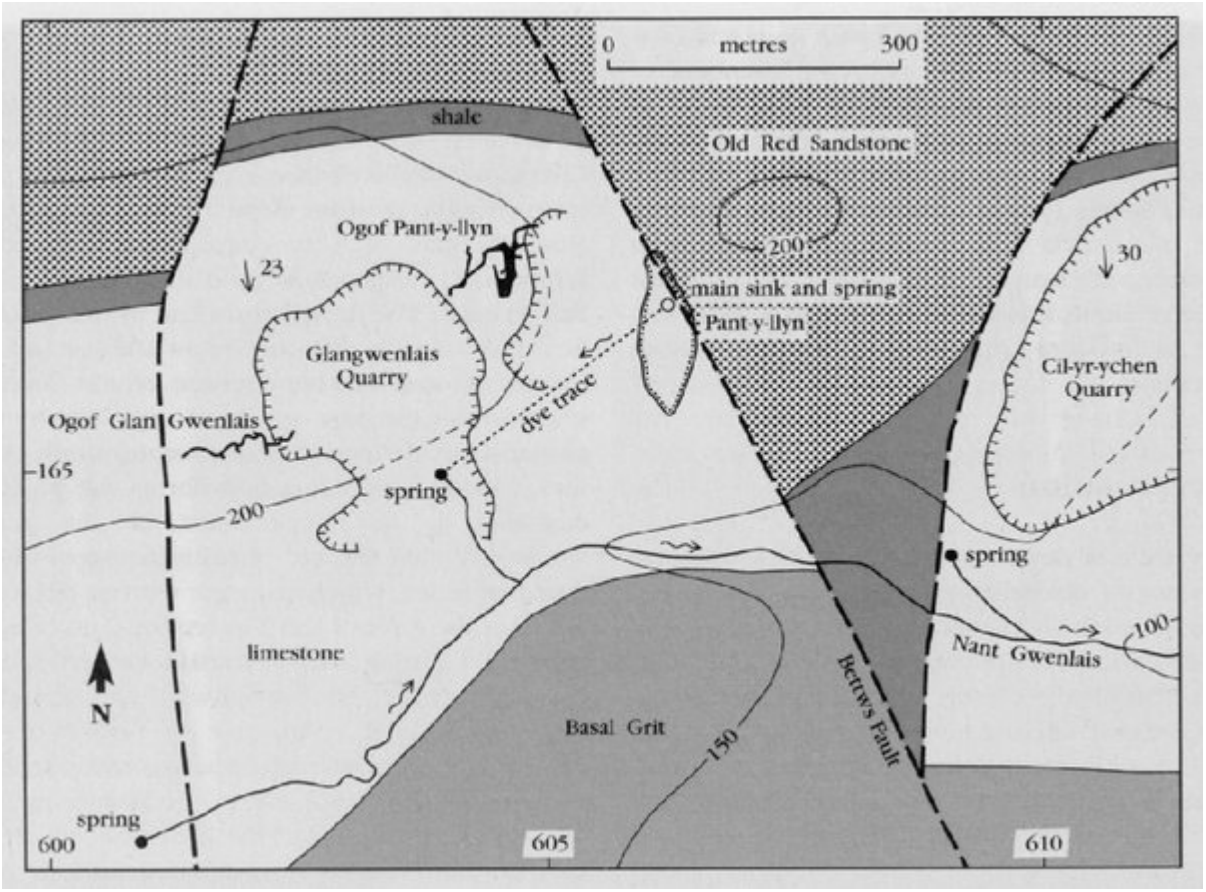
(Figure 6.19) The abandoned conduit of Megadrive in Ogof Draenen, with preserved solutional notches along the wall on the left. (Photo: C.D. Westlake.)



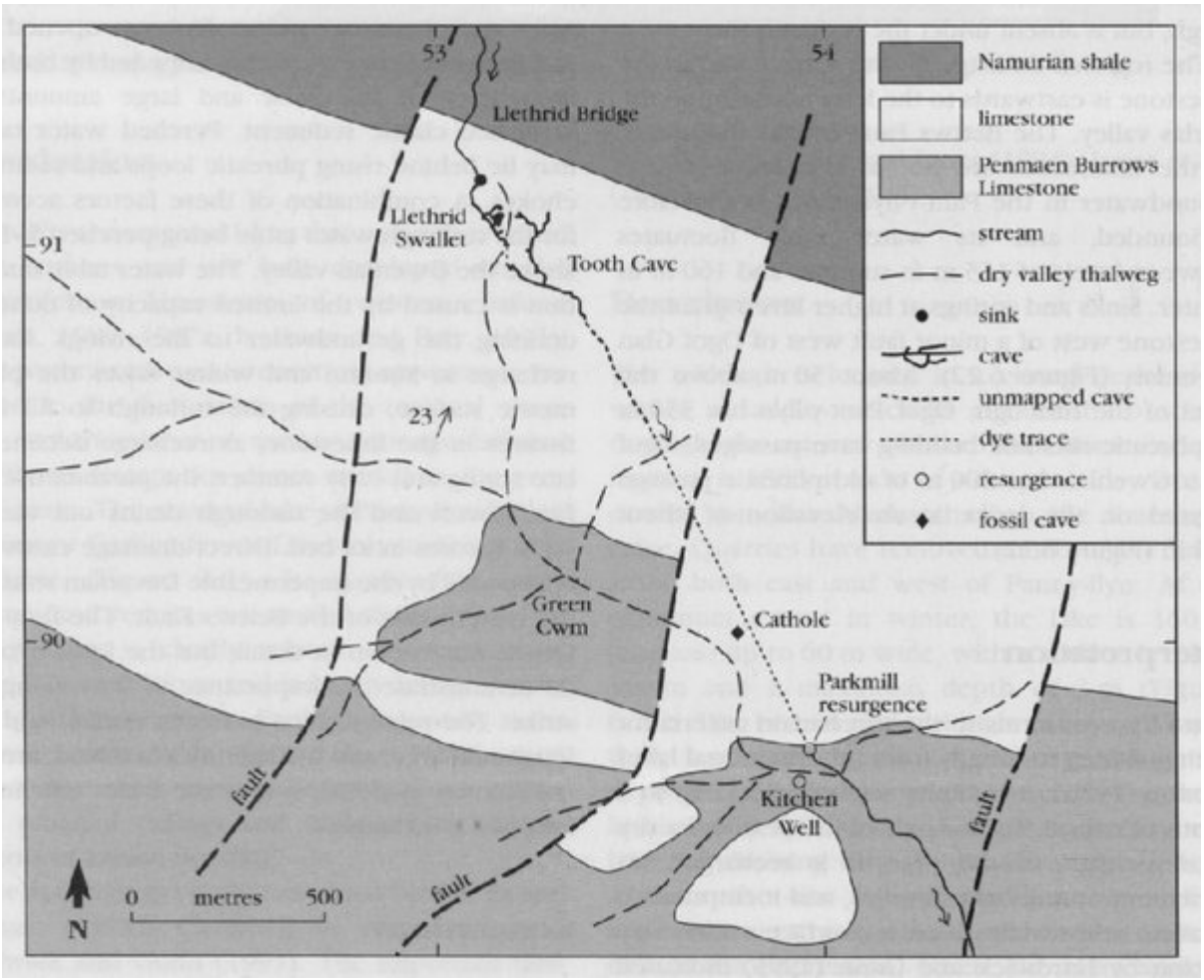
(Figure 6.20) Outline map of Otter Hole (from survey by Birmingham University Speleological Society).



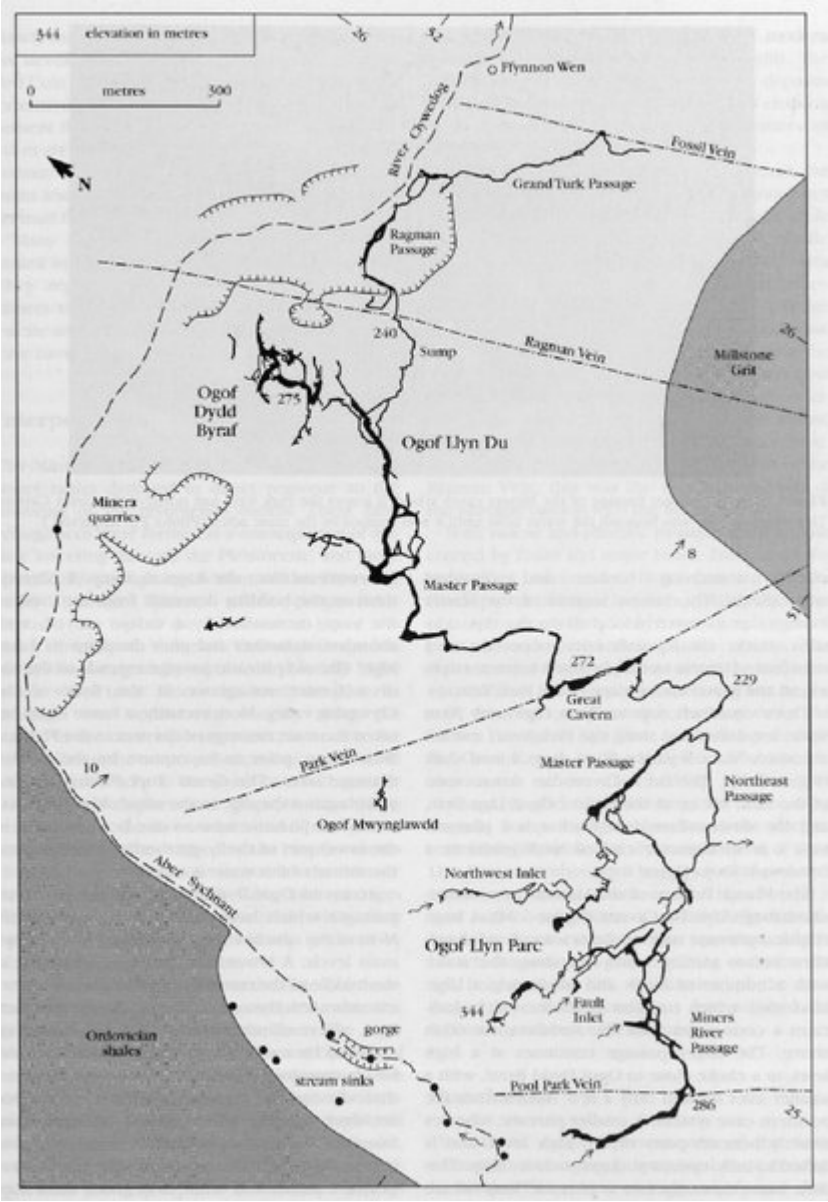
(Figure 6.21) The massive stalagmites and stalactites in the Hall of the Thirty in Otter Hole. (Photo: J.R. Wooldridge.)



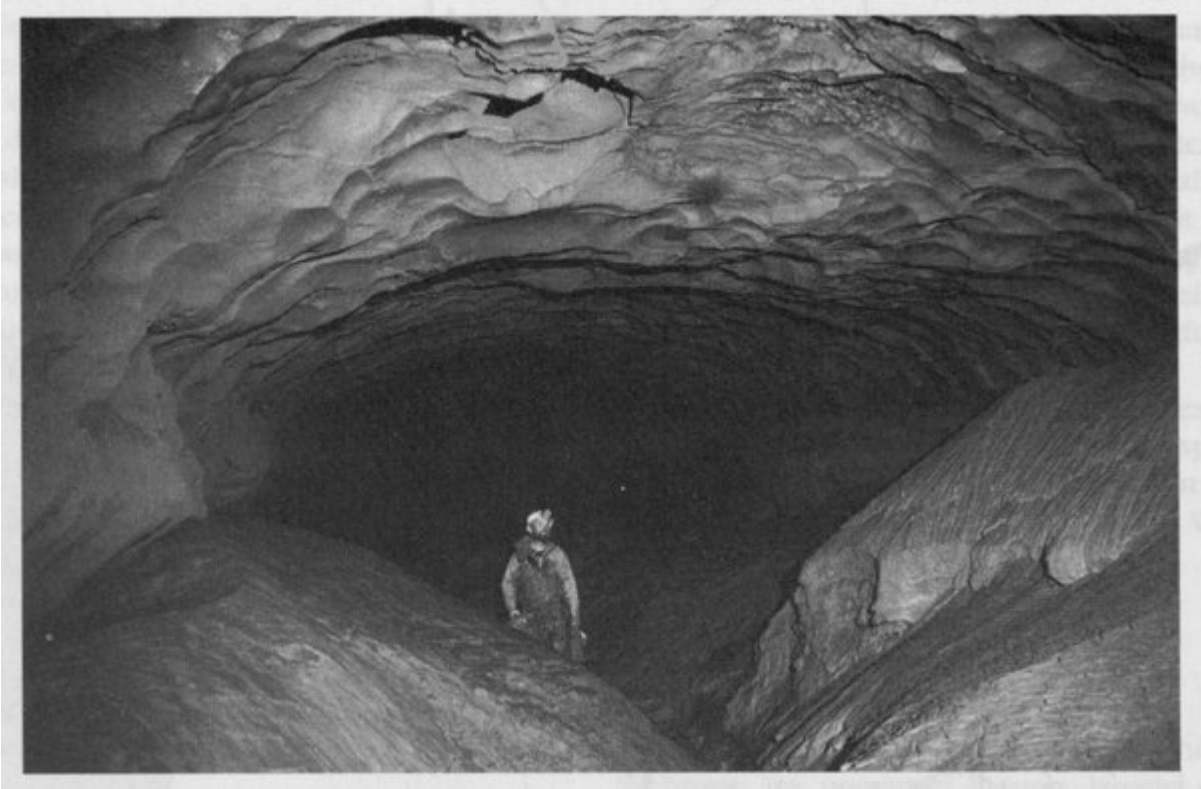
(Figure 6.22) Geological map of the area around Pant-y-llyn.



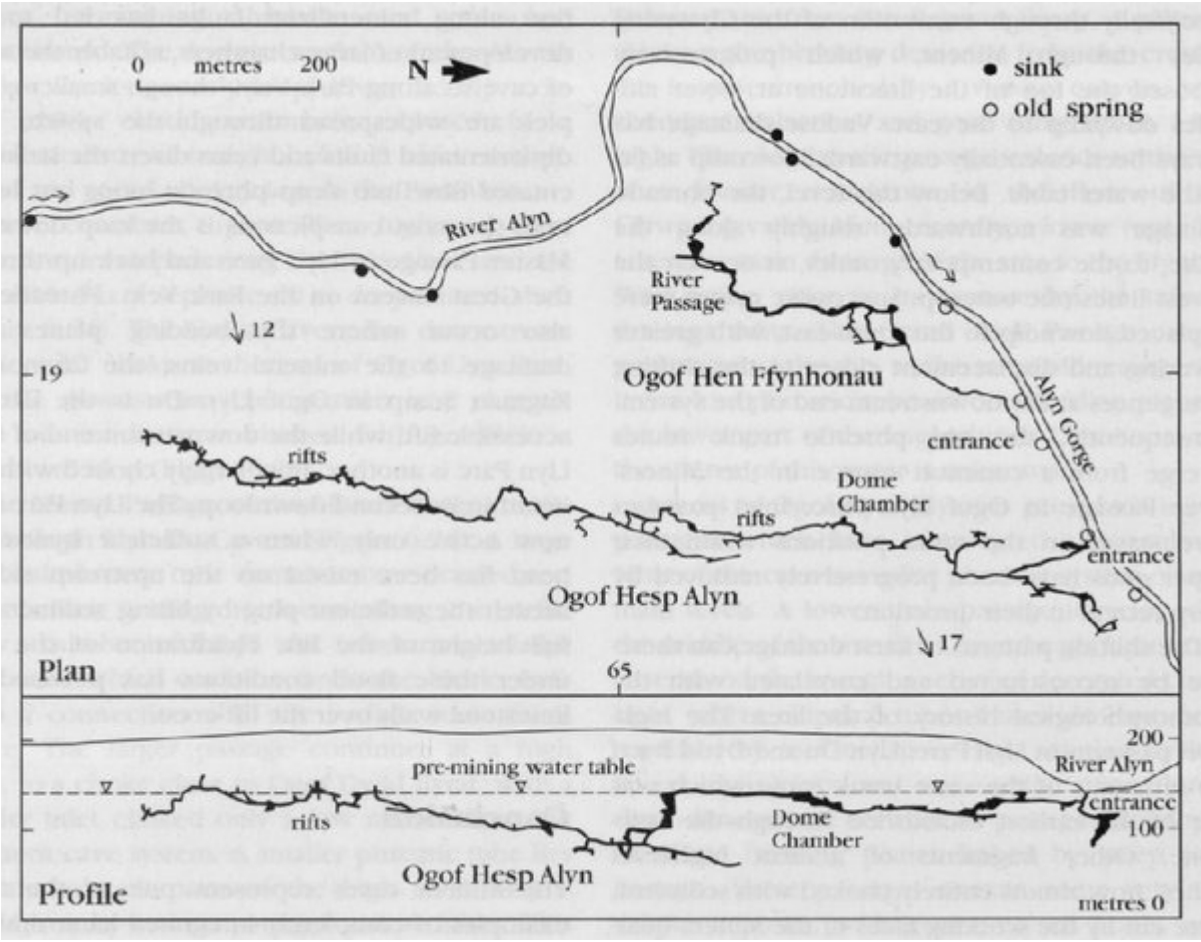
(Figure 6.23) Geological map of the dry valleys and caves of Llethrid. The position of the downstream section in Tooth Cave is only approximate, as it is normally flooded and has not been mapped in detail.



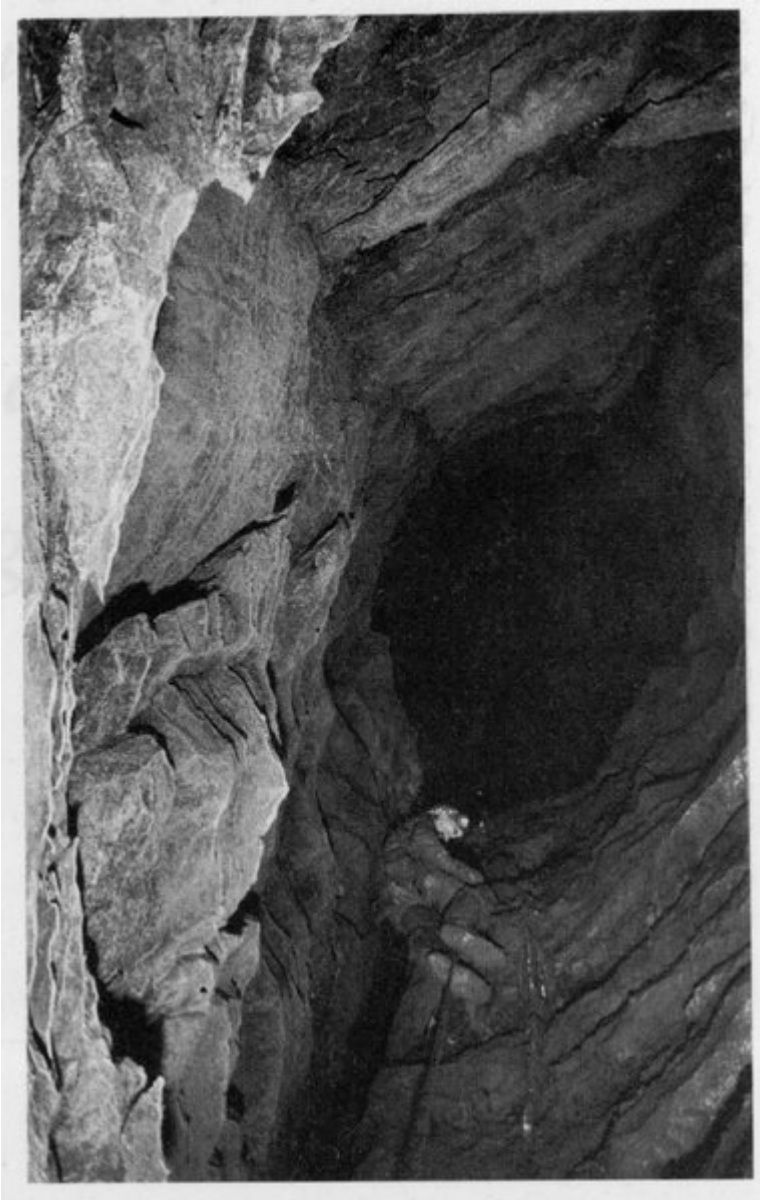
(Figure 6.24) Outline map of the caves of Minera (from surveys by North Wales Caving Club). The Ffynnon Wen resurgence is no longer active as its water has been captured by the deep mine adits.



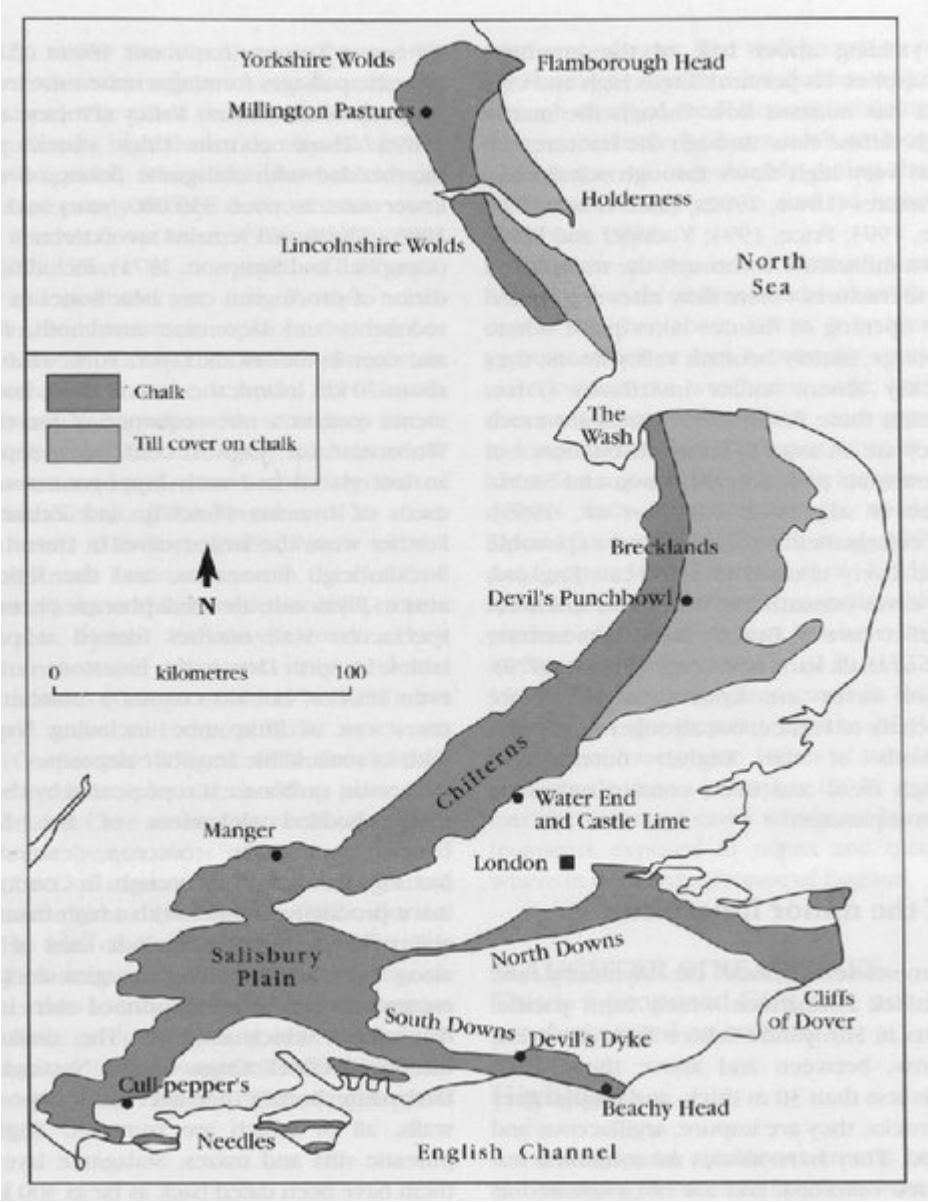
(Figure 6.25) The Master Passage of the Minera caves where it leaves the Park Vein just north of the Great Cavern. This phreatic tube was beneath the water table until it was drained by the mine adits. (Photo: P.J. Appleton.)



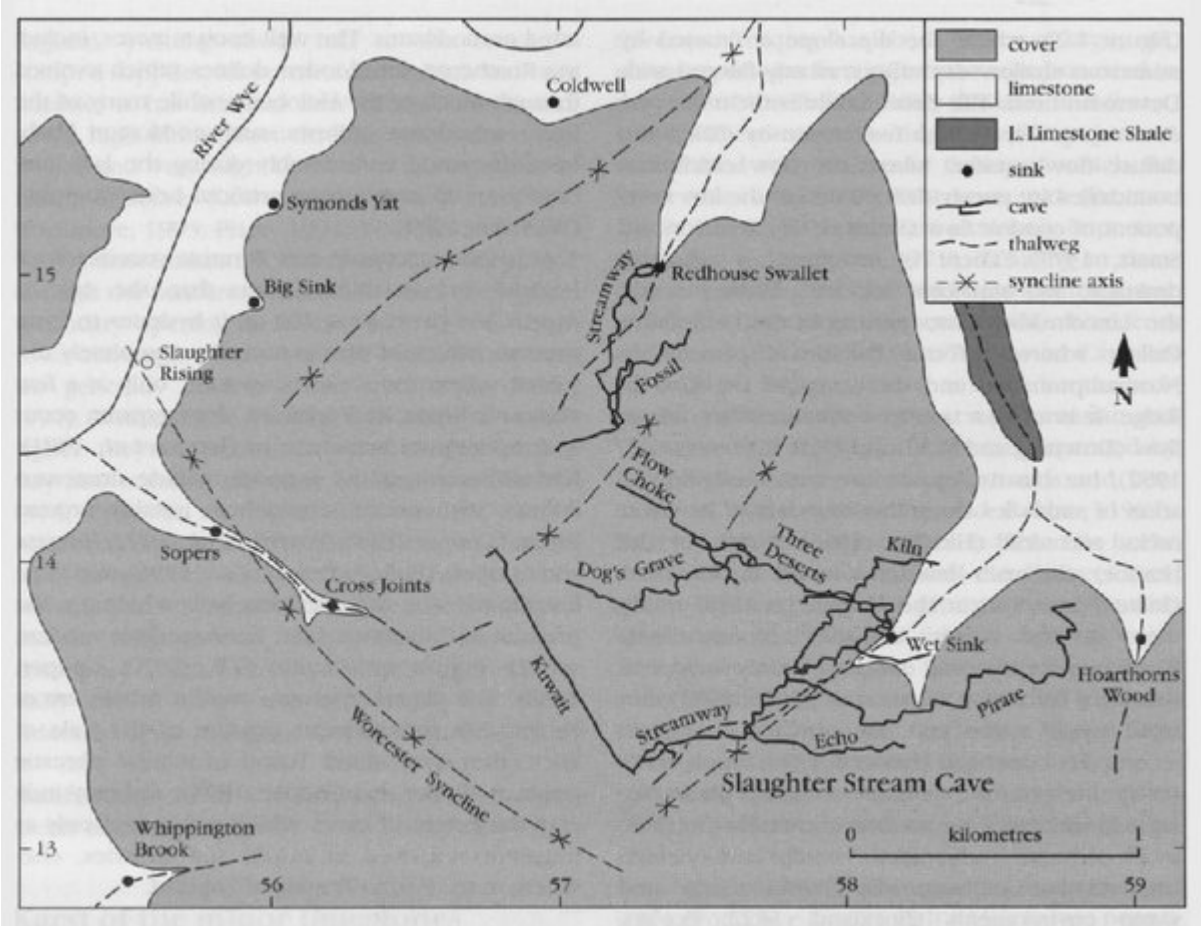
(Figure 6.26) Plan and profile of the caves beneath the River Alyn (from surveys by North Wales Caving Club). The surface river loses water at the various sinkholes along its course on the limestone. Only Ogof Hesp Alyn is shown on the profile; it was almost completely flooded until deep mine adits captured its water.



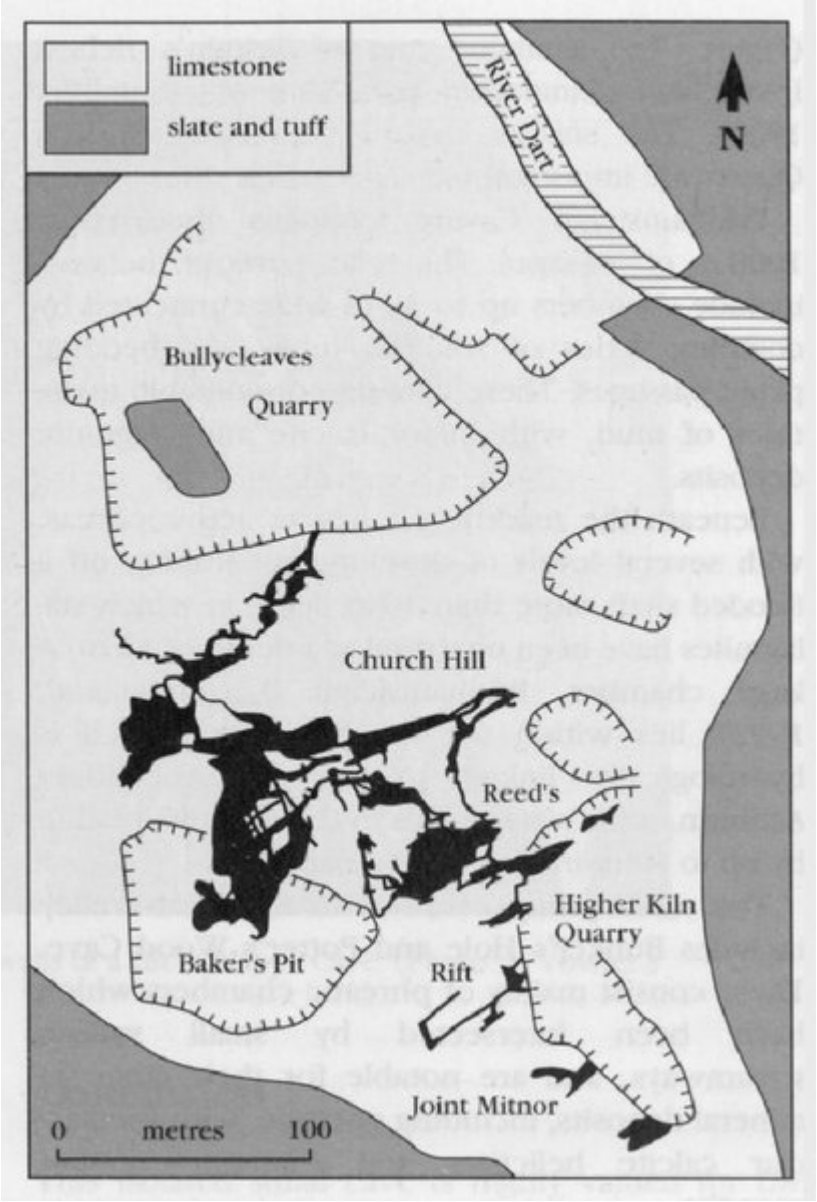
(Figure 6.27) Looking up the 15 m shaft in Ogof Hesp Alyn. This phreatic lift on a major joint was active and completely submerged until mine drainage lowered the water table in 1901. (Photo: P.J.Appleton.)



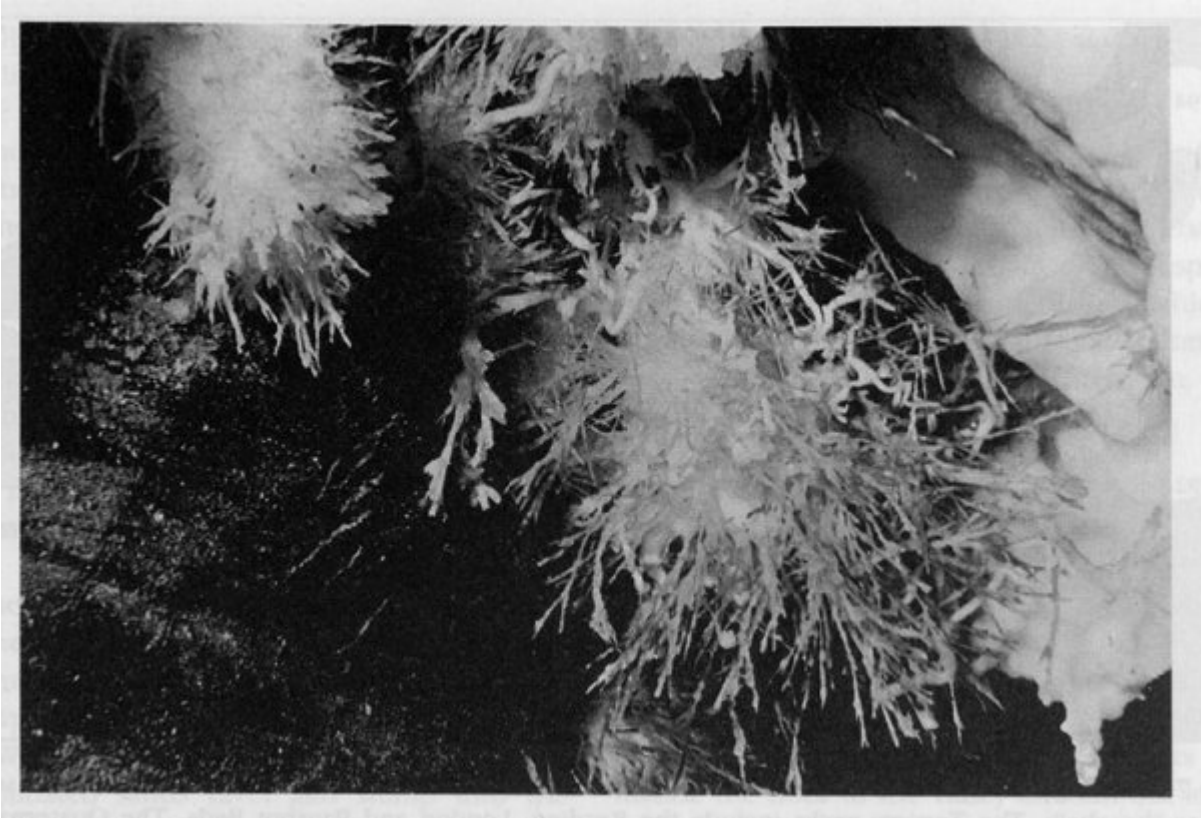
(Figure 7.1) Outline map of the chalk karst of England, with locations documented in the text. Superficial deposits occur on many parts of the Chalk outcrop; only the large areas of glacial till are distinguished on this map, as they mask most topographic expression of the karst.



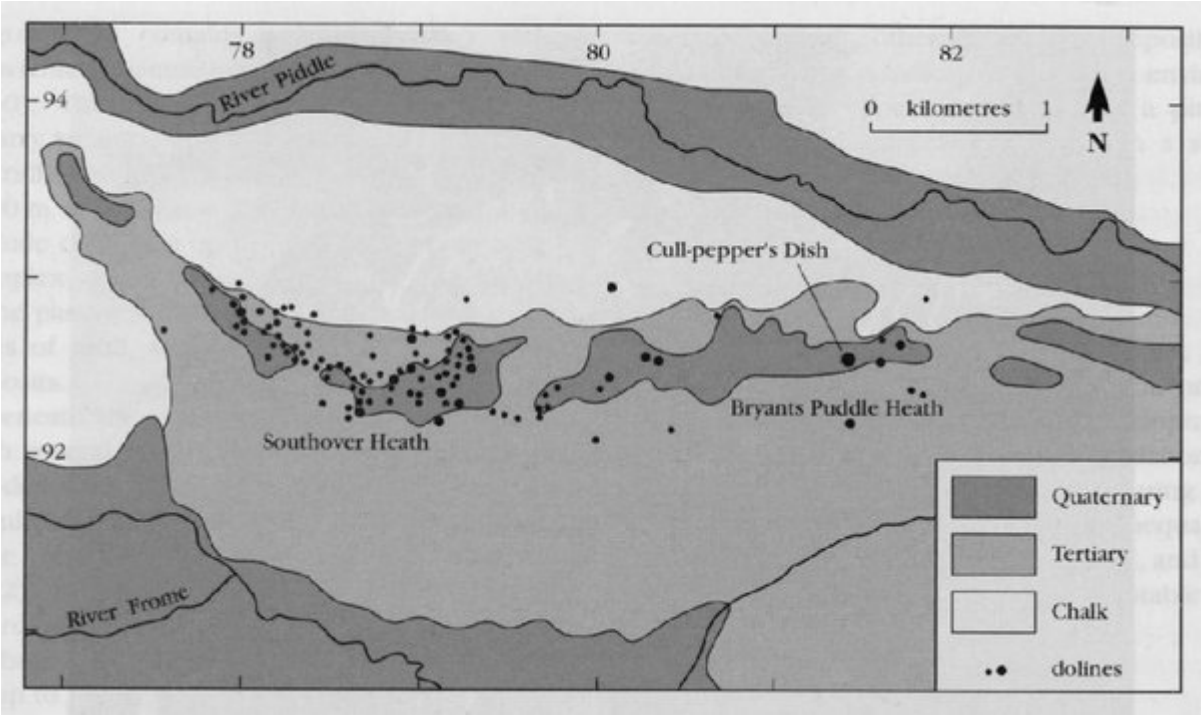
(Figure 7.2) Outline map of the caves in the catchment of the Slaughter Rising. The cover rocks are the Drybrook Sandstone and the Upper Coal Measures. All the sinks marked on the map have been dye traced to the Slaughter Rising (from survey by Royal Forest of Dean Caving Club).



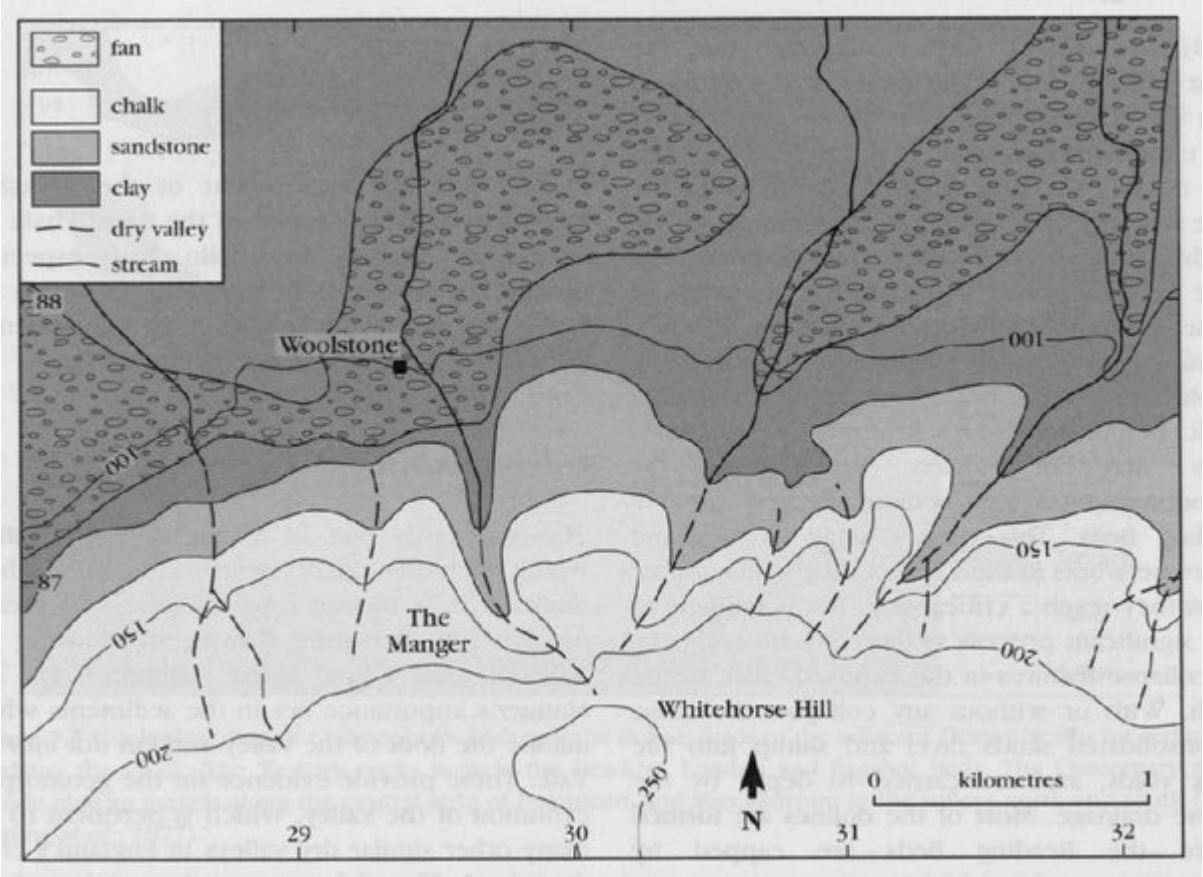
(Figure 7.3) Outline map of the caves of Buckfastleigh (from surveys by Devon Speleological Society).



(Figure 7.4) Clusters of delicate aragonite needles on the walls of a rift in Napps Cave. (Photo: F. Vowler.)

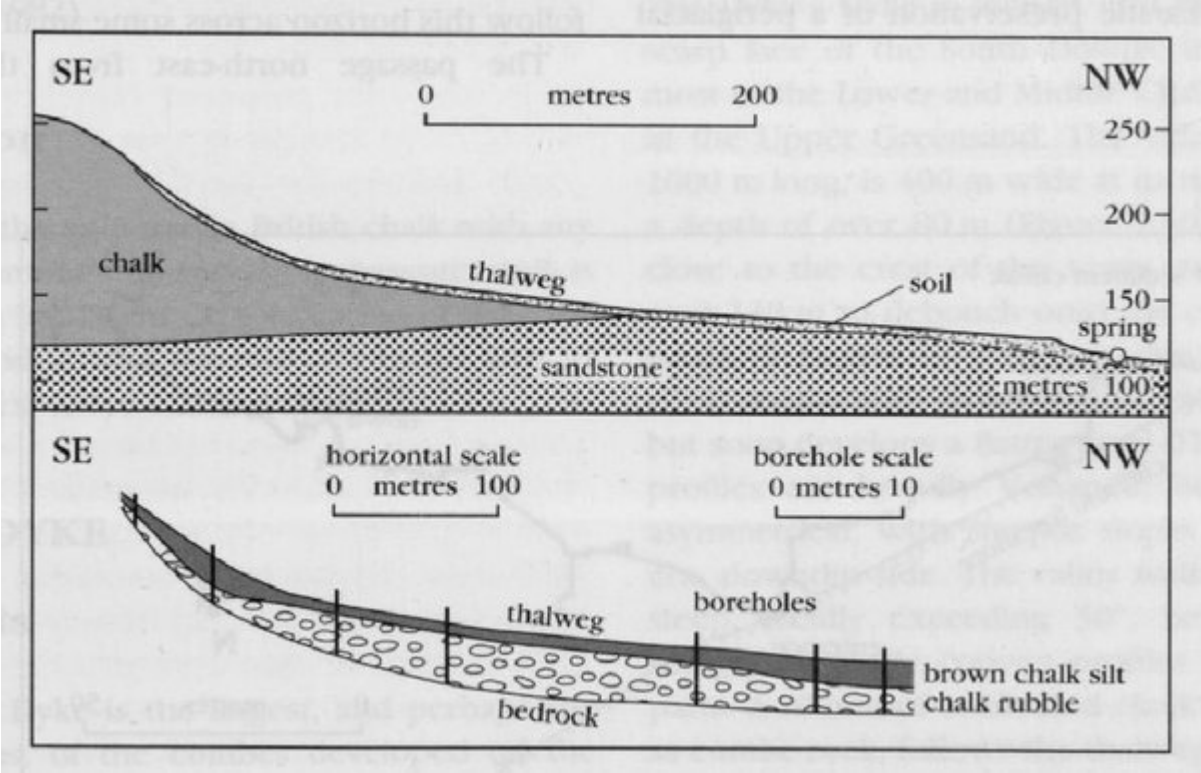


(Figure 7.5) Geological map of Cull-pepper's Dish and the doline fields of the adjacent Dorset heaths on sediments overlying the chalk. The Tertiary rocks include the Reading, London and Bagshot Beds. The Quaternary rocks include plateau gravels along the central strip of heathland, and also alluvium in the valleys north and south (after Sperling et al., 1977).

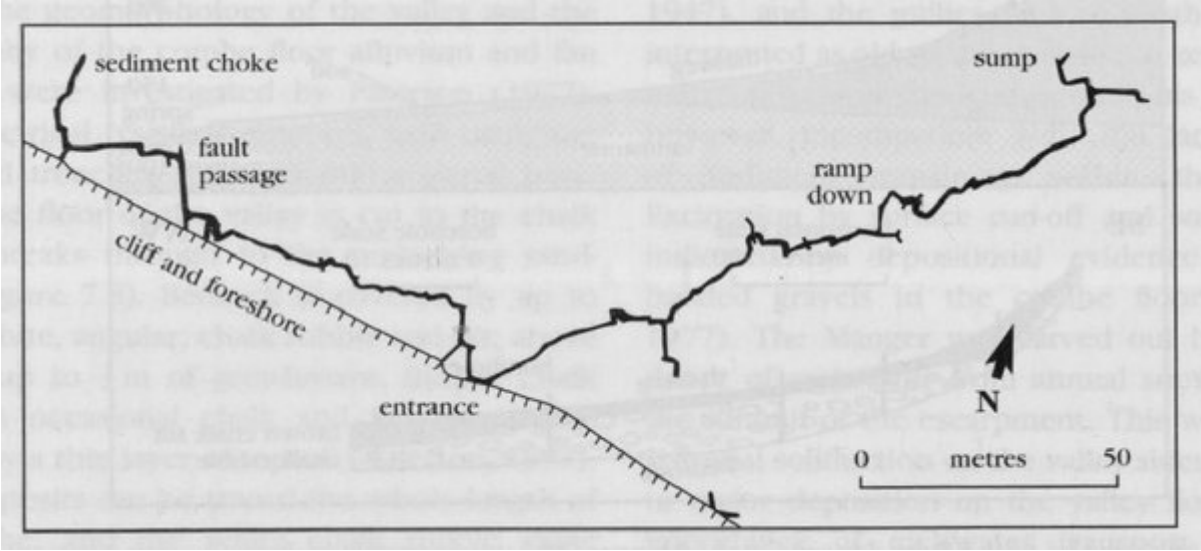


(Figure 7.6) Geological map of the Berkshire Downs scarp face, with its dry valleys, or combes, including the Manger, and associated fan deposits.

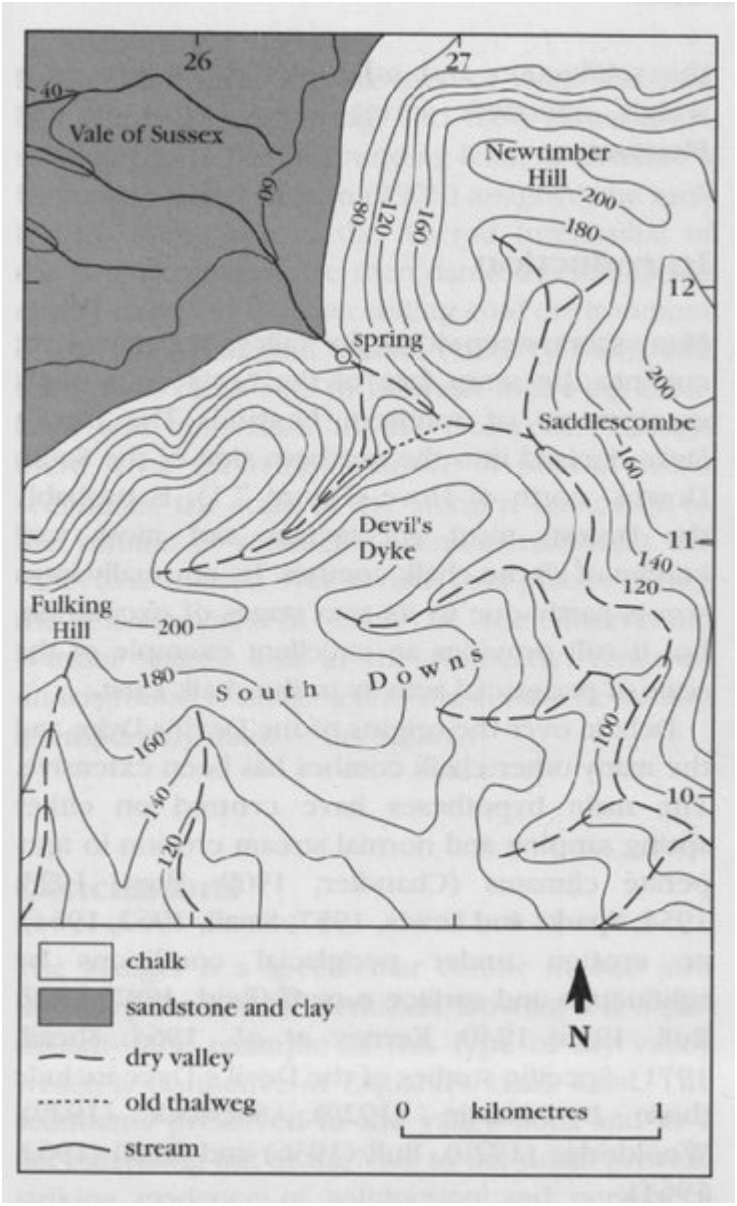
(Figure 7.7) The dry valley of the Manger seen from its head; the chalk of its south slope is scored by the series of furrows or small-scale combes, above the flatter valley floor veneered by solifluction debris. (Photo: A.C. Waltham.)



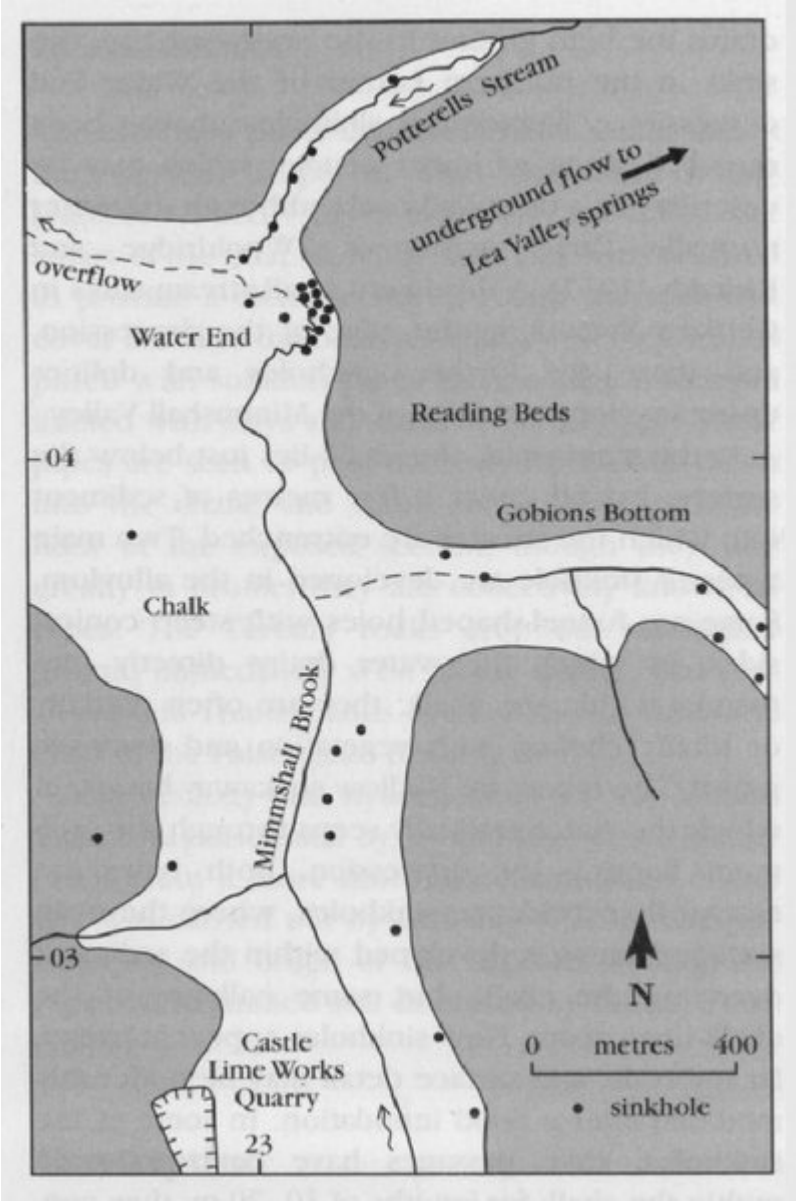
(Figure 7.8) Long profiles of the floor deposits in the Manger. The upper profile is drawn to true horizontal and vertical scales. In the lower profile the soil thicknesses are increased by a factor of 8 (after Paterson, 1977).



(Figure 7.9) Outline map of Beachy Head Cave (from survey by Chelsea Speleological Society).



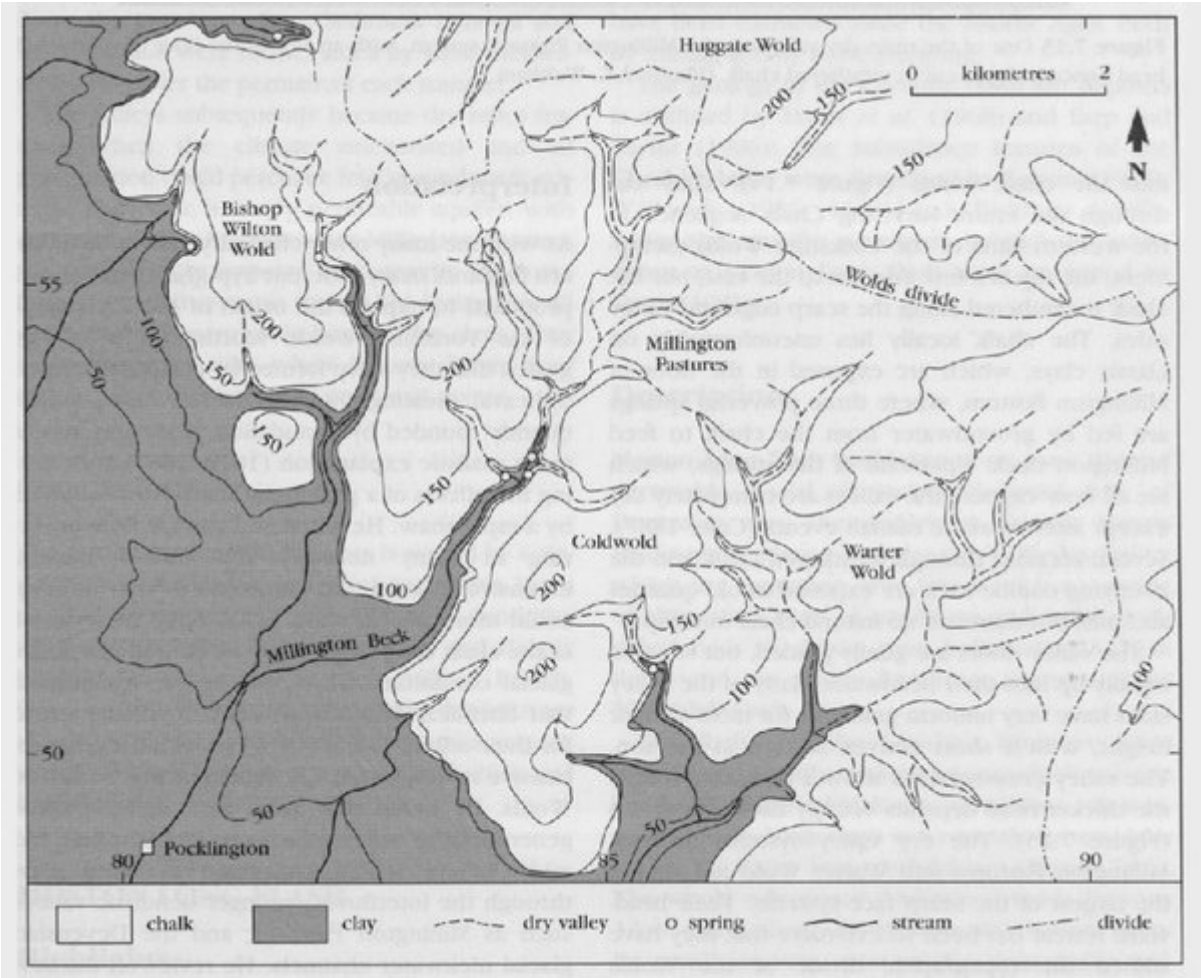
(Figure 7.10) Topographic map of the Devil's Dyke and the Saddlescombe dry valleys on the South Downs.



(Figure 7.11) Geological map of the Mimmshall Valley with the Water End sinkholes and the Castle Lime Works Quarry.

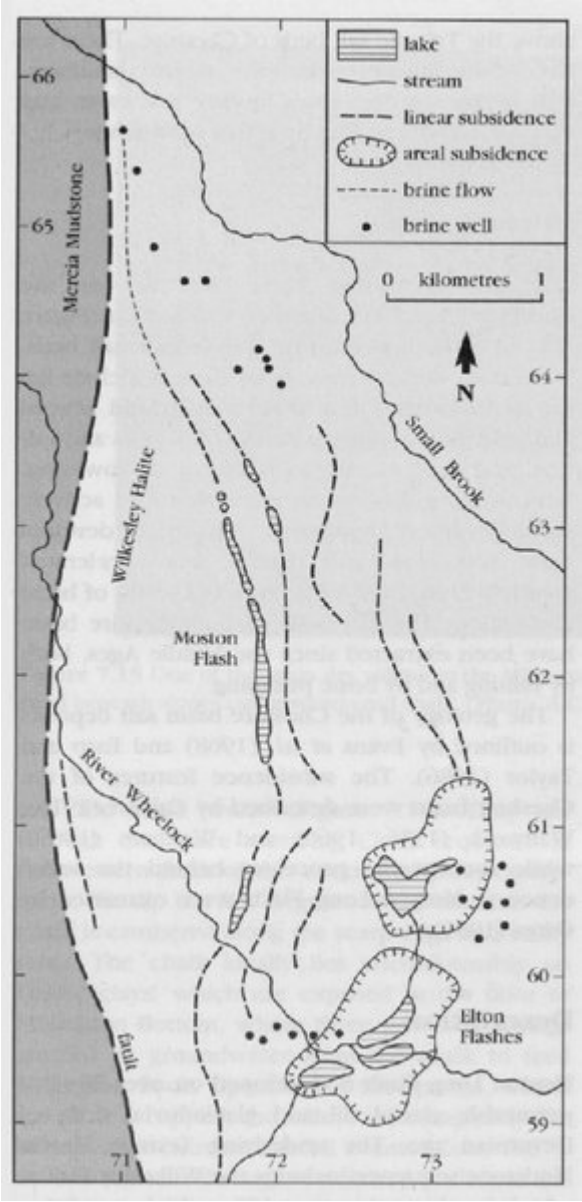
(Figure 7.12) A section of the preserved face in the Castle Lime Works Quarry exposing the extremely irregular upper surface of the chalk, broken by clay-filled pipes and broader depressions. (Photo: A.C. Waltham.)

(Figure 7.13) The Devil's Punchbowl doline with a lake on its floor in April 1982. (Photo: A.C. Waltham.)

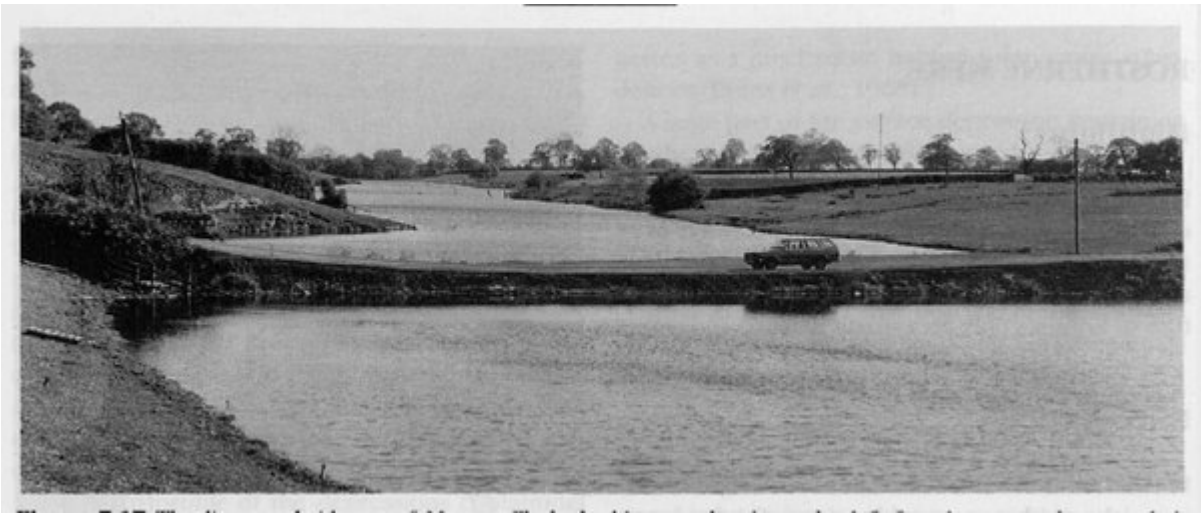


(Figure 7.14) Outline map of the dry valley systems of Millington Pastures and its neighbours in the Yorkshire Wolds chalk escarpment. The chalk outcrop includes those of the impure, red Ferriby and Hunstanton Chalks, forming the lowest 25 m. Only the larger springs are marked.

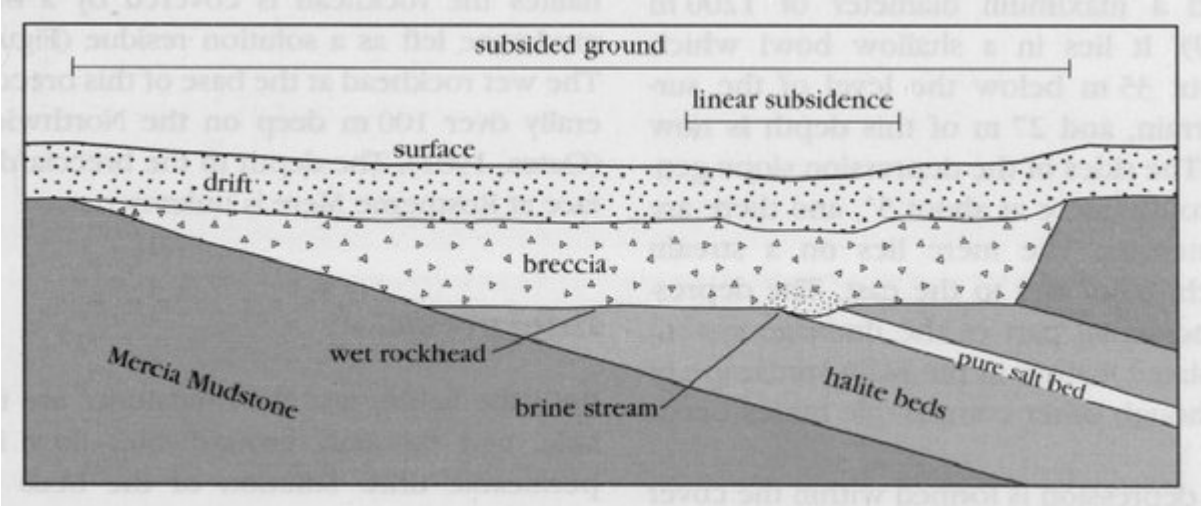
(Figure 7.15) One of the main dry valleys in the Millington Pastures system, with an almost flat floor of soliflucted head beneath slopes cut in weathered chalk. (Photo: A.C. Waltham.)



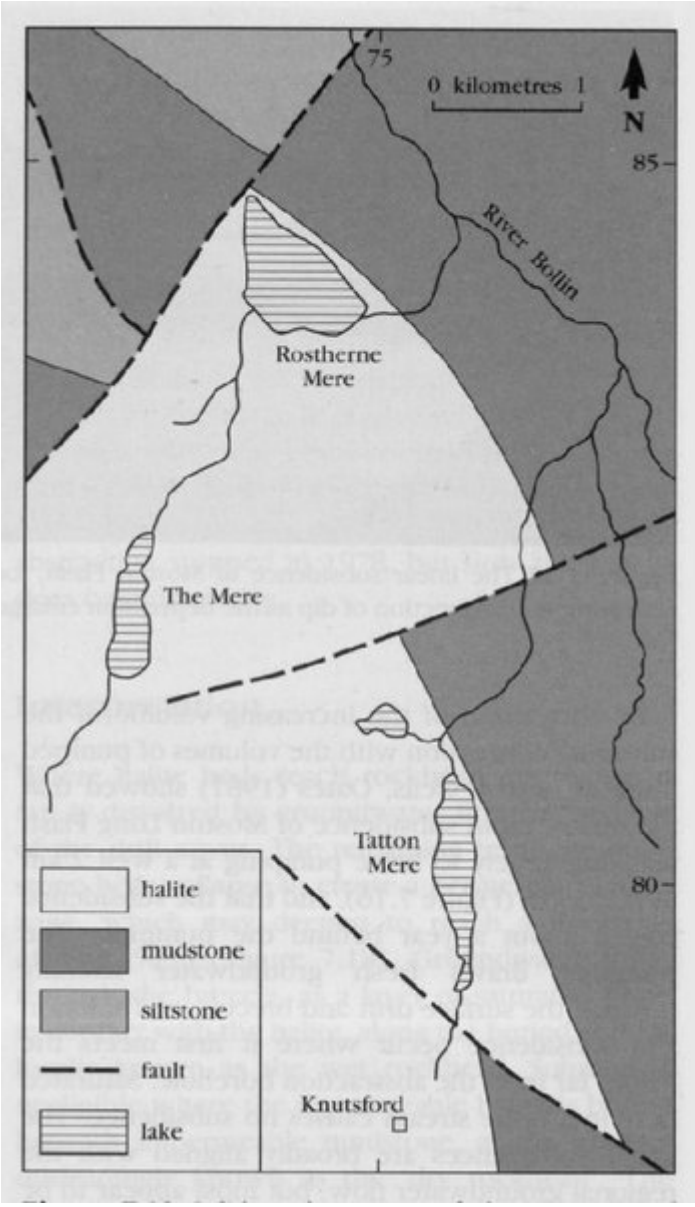
(Figure 7.16) Outline map of Moston Flash and the adjacent linear and areal subsidences formed over the Wylkesley Halite. There is no solid outcrop as the entire area is covered by about 20 m of glacial till and glaciofluvial gravels. All the brine wells have now ceased pumping (after Oates, 1981, and Waltham, 1989).



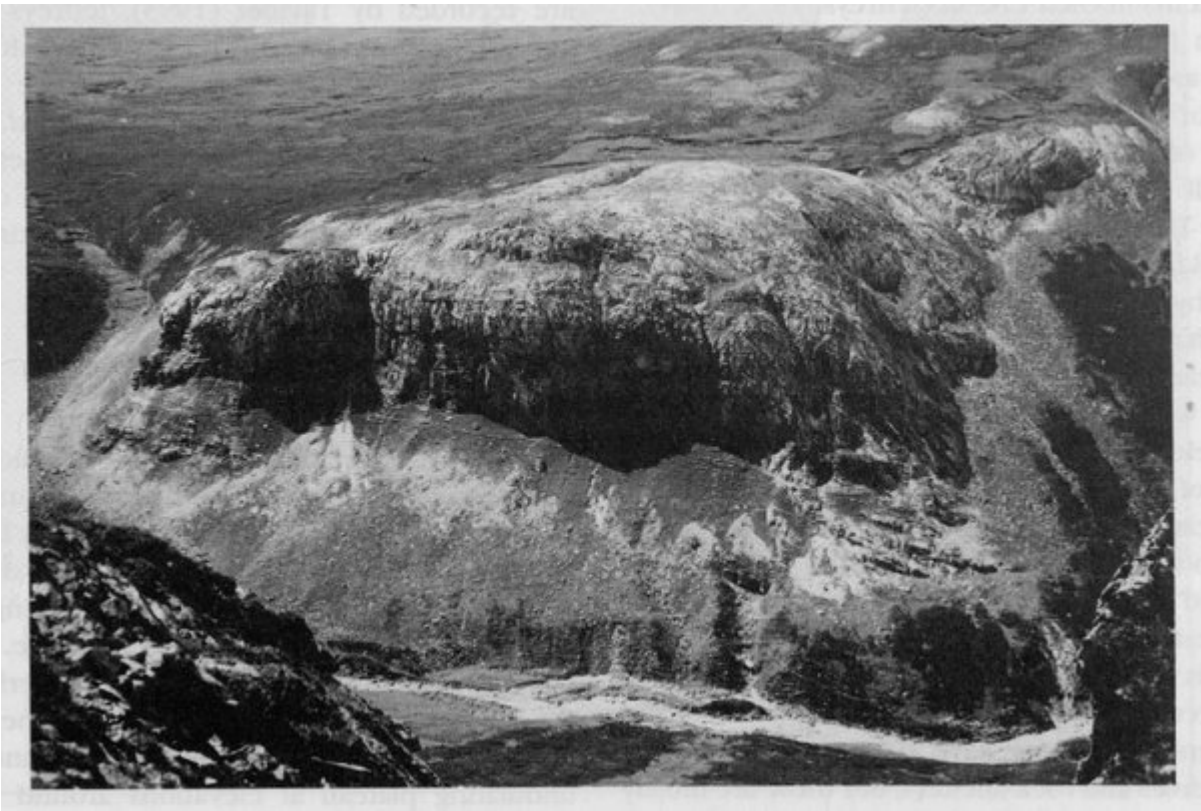
(Figure 7.17) The linear subsidence of Moston Flash, looking south where the left face is steeper because it is retreating in the direction of dip as the depression enlarges. (Photo: A.C. Waltham.)



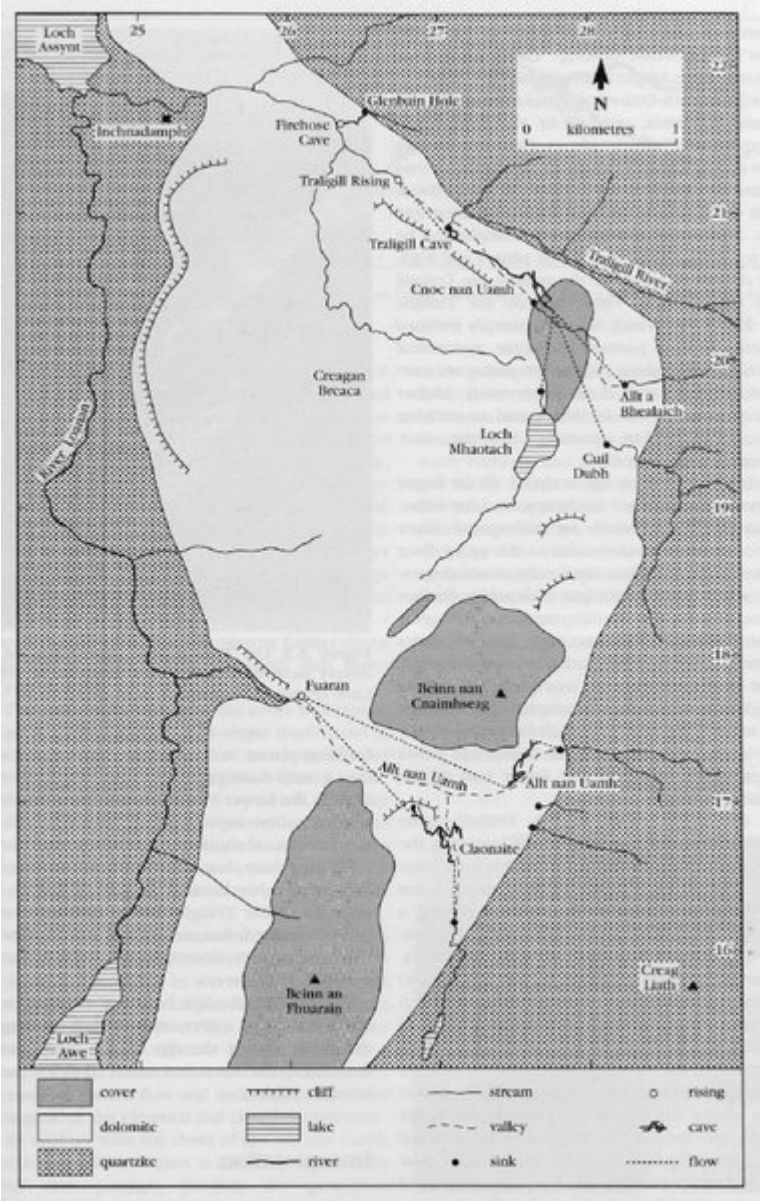
(Figure 7.18) Diagrammatic section through the breccia of solutional residue at the rockhead in salt karst, with a brine stream flowing beneath an active linear subsidence like Moston Long Flash (from Waltham, 1989).



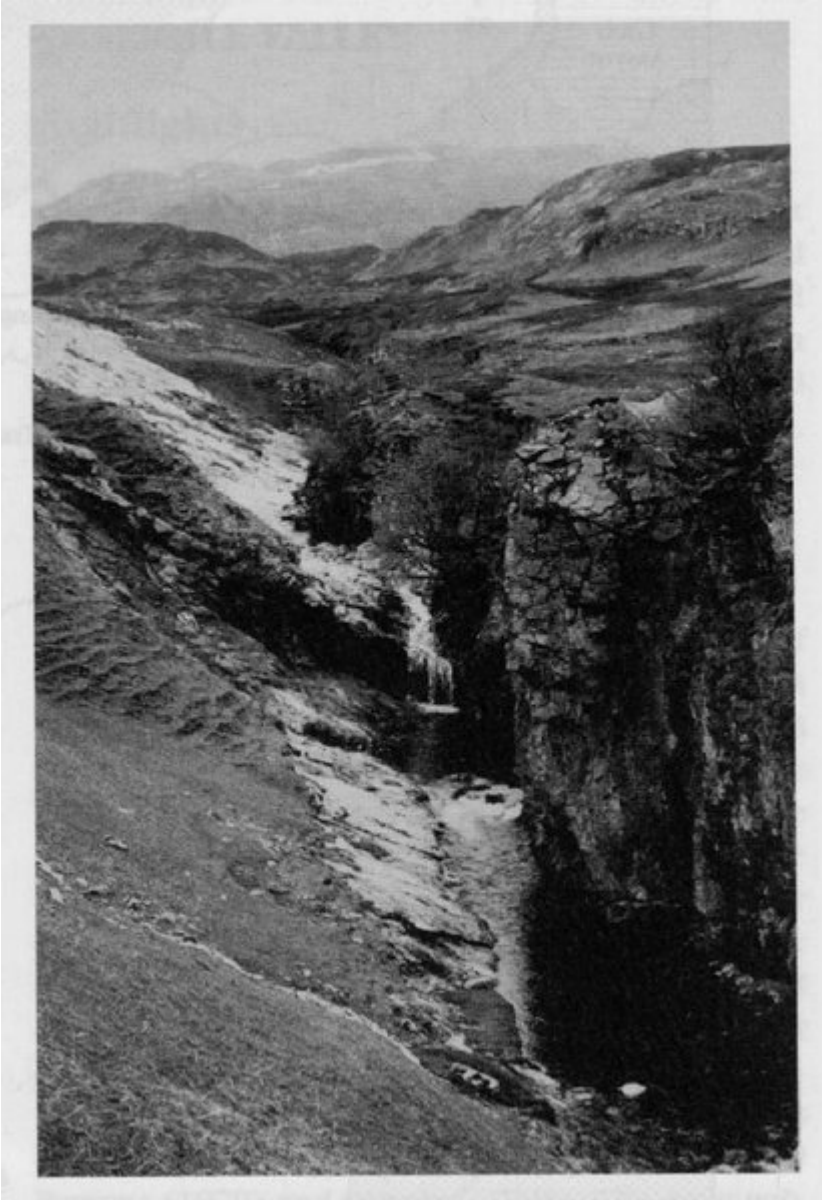
(Figure 7.19) Solid geology map of the area around Rostherne Mere and the other adjacent subsidence depressions over the Northwich Halite, buried by a complete cover of glacial and glaciofluvial drift.



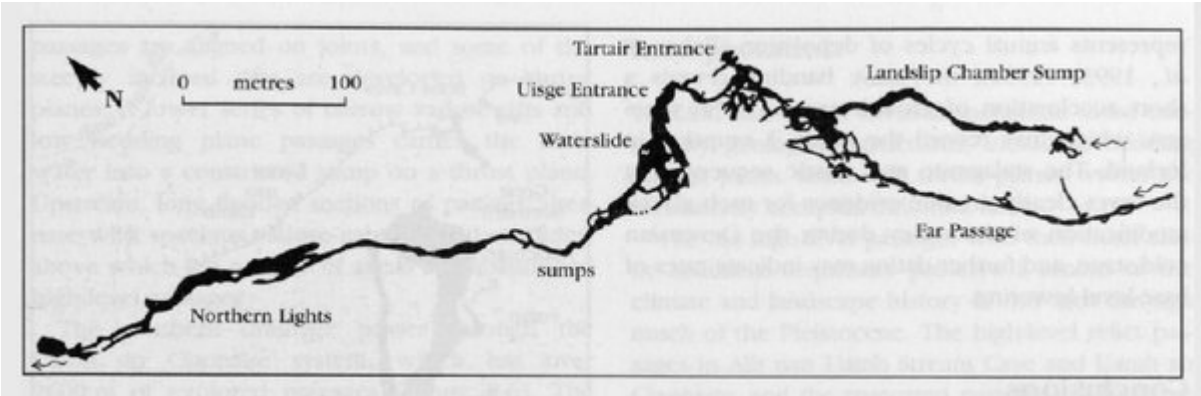
(Figure 8.1) The limestone crags of Creag nan Uamh containing the Bone Caves, south of the Allt nan Uamh, seen from Beinn nan Cnaimhseag, with the Claonaite valley on the left. (Photo: TJ. Lawson.)



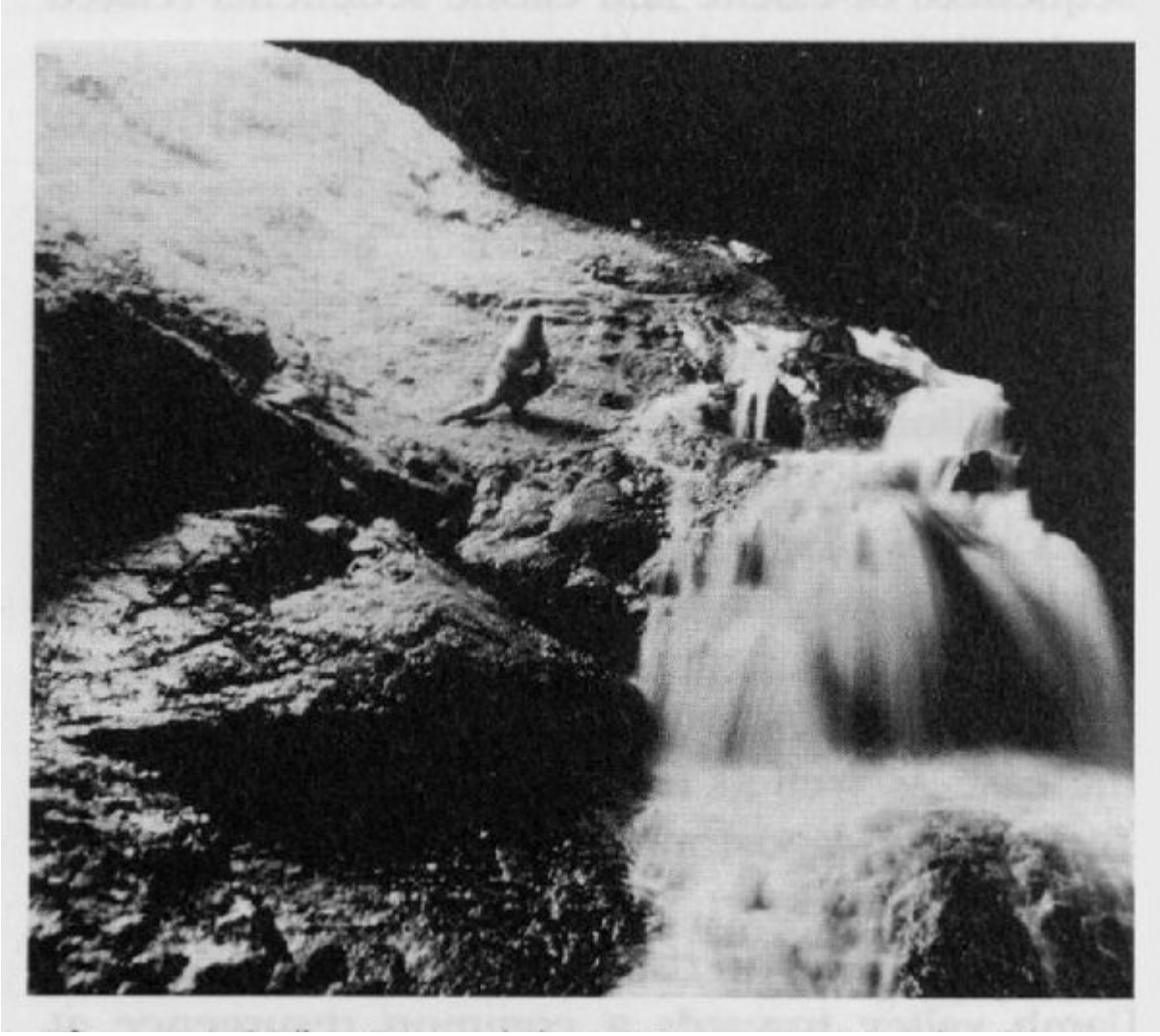
(Figure 8.2) Geological map of the main karst belt in Assynt, containing the caves of the Traligill and Allt nan Uamh Valleys. The dolomites belong to the Durness Group and are underlain by the Lower Palaeozoic quartzites. The cover rocks are klippe of Cambrian quartzite and Eocambrian sandstone lying over major thrust planes.



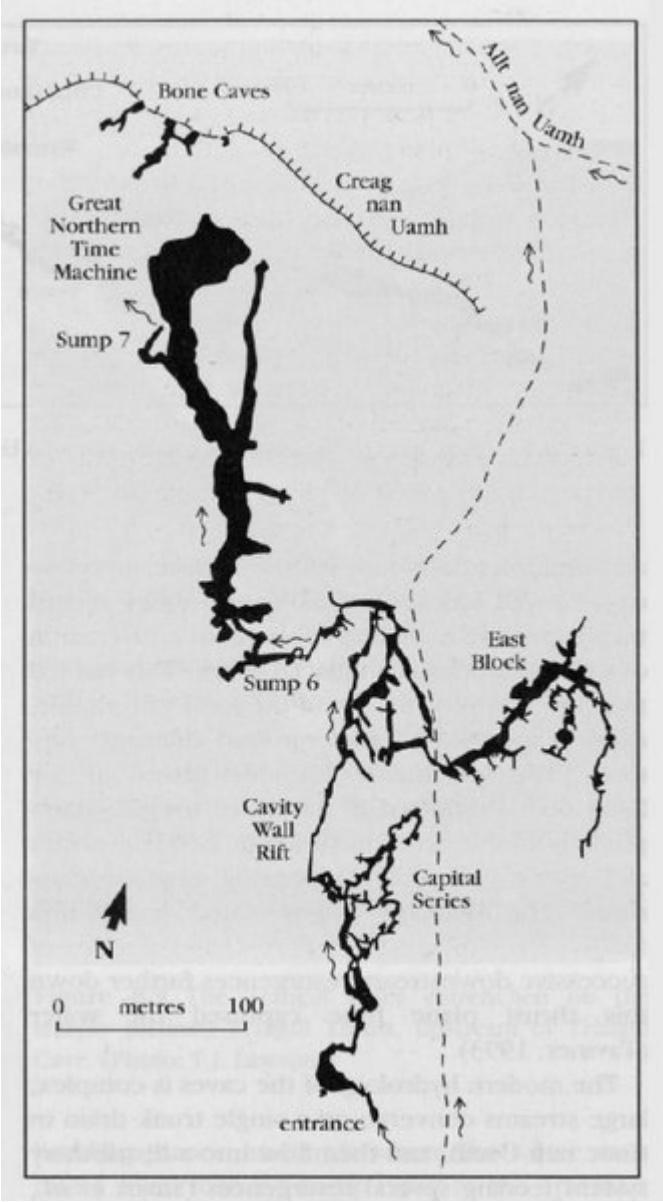
(Figure 8.3) The Traligill River entrenched on the steeply inclined Traligill Thrust, upstream of Traligill Cave. (Photo: T.J. Lawson.)



(Figure 8.4) Outline map of the cave system of Cnoc nan Uamh (from survey by Grampian Speleological Group).



(Figure 8.5) The Waterslide in Cnoc nan Uamh. (Photo: A.C. Waltham.)



(Figure 8.6) Outline map of Uamh an Claonaite; the survey beyond sump 6 is only a preliminary drawing (from surveys by Grampian Speleological Group).

Region	Yorkshire Dales[1]	Northern Pennines[2]	Peak District	Mendip Hills	South Wales	Rest of Britain[3]
Geology						
Karst area[4]	320 km²	220	420 km²	110 km²	220 km²	9000 km² (mostly chalk)
Karst relief[5]	270 m	70 m	260 m	260 m	550 m	200 m (chalk)
Limestone thickness[6]	200 m	40 m	400 m	700 m	150 m	200 m (chalk)
Typical dip	1°	1°	5°	30°	10°	Varies between areas
Last glaciation	Devensian	Devensian	Anglian[7]	None	Devensian	Varies between areas
Karst[8]						
Glaciokarst	• • •	• •				• (Scotland)[9]
Fluviokarst			• •	• •		• • (chalk)
Interstratal karst			•		• •	
Pavement area[10]	677 ha	613 ha	0	0	8 ha	28 ha (Scotland, North Wales)
Dry valleys	•		• •	•	•	• • (chalk)
Karst gorges	• •	•	•	• •		
Collapse features	•		•			
Doline fields	• •				• •	• • (covered chalk)
Ephemeral lakes					•	• (chalk)
Polygonal karst	•			•		
Famous sites	Malham Cove Gaping Gill	Hutton Roof Crags	Dove Dale Peak Cavern	Cheddar Gorge Wookey Hole	Dan-yr-Ogof Porth-yr-Ogof	
Caves						
Major passage types	Vadose joint shafts, phreatic on bedding	Joint mazes	Phreatic on veins and bedding	Downdip phreatic loops	Downdip vadose, strike phreatic	Vary between areas
Number of caves[11]	1420	620	210	220	270	410
Total cave length[11]	325 km	65 km	50 km	55 km	195 km	45 km
Caves over 1 km long	50	9	9	10	12	6
Longest caves[12] (km)	Ease Gill System 71 Kingsdale System 24 Gaping Gill System 18 Ireby-Notts System 12	Goyden Pot 6 Knock Fell Caverns 5 Fairy Hole 4 Devis Hole 2	Peak-Speedwell System 14 Giants Hole 5 Bagshaw Cavern 4 Carlswark Cavern 2	Swildon's Hole 9 St Cuthbert's Swallet 7 Wookey Hole 4 Gough's Cave 2	Ogof Ffynnon Ddu 50 Ogof Draenen 48 Ogof Agen Allwedd 34 Ogof Daren Cilau 30	Slaughter Cave 11 (Forest of Dean) Ogof Llyn Parc 4 (North Wales) Uamh an Claonaite 3 (Scotland) Ogof Llyn Du 2 (North Wales)
Deepest caves[12] (m)	Ease Gill System 211 Mercgill Hole 206 Pen y ghent Pot 196 Gaping Gill System 195	Goyden Pot 61 Scrafton Pot 44 Pate Hole 33 Aylebarn Mine Cave 30	Giants Hole 214 Masson Cavern 1 90 Peak-Speedwell System 184 Nettle Pot 180	Eastwater Cavern 180 Longwood Swallet 175 Swildon's Hole 167 Manor Farm 151	Ogof Ffynnon Ddu 308 Ogof Daren Cilau 217 Ogof Agen Allwedd 177 Dan-yr-Ogof 140	Ogof Llyn Parc 115 (North Wales) Slaughter Cave 99 (Forest of Dean) Cnoc nan Uamh 90 (Scotland) Ogof Hesp Alyn 90 (North Wales)

1 The main southern Dales area on the Askrigg Block, including Dentdale, and excluding Nidderdale.
2 Including Nidderdale, the karst east of Morecambe Bay, and the eastern fringe of the Lake District.
3 Mostly the weakly cavernous karst of the chalk and oolitic limestones; including the cavernous karst of Devon, Forest of Dean, North Wales and Scotland.
4 Approximate area of karstic landscapes; does not include all the limestone outcrops.
5 Approximate values for the local relief within the limestone, which dictates the maximum descent from sink to rising, added to any depth of karstification beneath the resurgence level.
6 Geological data are generalized for purposes of comparison.
7 Or possibly Wolstonian – see text.
8 Most karst features are found to some extent in all the main karst regions, but their importance is assessed in relative terms:
• = significant, but minor;
• • = important and widespread;
• • • = internationally important.
9 Location of the major features noted in parentheses.
10 From Ward and Evans (1976).
11 Recorded caves longer or deeper than 5 m; figures rounded to nearest 10 caves and 5 km of passage; from unpublished database of Limestone Research Group, University of Huddersfield.
12 Subject to continuous revision, as lengths (and less frequently depths) are increased by newly discovered passages or by links found between known caves.

(Table 1.1) A comparison of the major features which give the individual character to each main karst region of Britain

Feature	Prime example	Important examples
Limestone karst		
Dolines	Ingleborough karst	Wurt Pit, Sandpit, High Mark
Dry valley	Lathkill Dale	Cave Dale, Conistone, Malham & Gordale
Karst gorge	Cheddar Gorge	Malham and Gordale, Hell Gill, Winnats
Collapsed cave	Penyghent Gill	God's Bridge, Porth-yr-Ogof
Limestone pavement	Great Asby Scar	Scales Moor, Ingleborough, Gait Barrows
Glaciokarst	Malham & Gordale	Ingleborough, Traligill
Fluviokarst	Manifold Valley	Lathkill Dale, Dove Dale
Polygonal karst	High Mark	Brimble & Cross
Interstratal karst	Mynydd Llangynidr	Draenen, Nidderdale, Llangattwg
Fossil karst	Green Lane Pits	Masson Hill, Pikedaw
Limestone caves		
Deep phreatic	Wookey Hole	Ease Gill, Cheddar
Shallow phreatic	Kingsdale caves	Ingleborough
Abandoned phreatic	Dan-yr-Ogof	Alyn Gorge, Ingleborough, Castleton, Llangattwg, Minera, Priddy, Sleets Gill
Maze cave	Knock Fell Caverns	Mossdale and Langcliffe, Hale Moss
Vadose canyons	Ease Gill Caves	Ogof Ffynnon Ddu, Castleton
Vadose shafts	Ingleborough caves	Ease Gill, Brants Gill, Buttertubs
Calcite deposits	Otter Hole	St Dunstan's, Boreham, Dan-yr-Ogof
Dated sediments	Charterhouse caves	Cheddar, Traligill, Ease Gill
Chalk karst		
Dolines	Cull-pepper's Dish	Devil's Punchbowl, Castle Lime Quarry
Dry valleys	Millington Pastures	Manger, Devil's Dyke
Cave	Beachy Head Cave	Water End
Salt karst		
Subsidence	Moston Long Flash	Rostherne

(Table 1.2) The finest examples of individual karst and cave features within the GCR sites of Britain. The listing of features is in the order of their description in Chapter 1. The tabulated data are recognized as being subjective, especially

among the important secondary examples, which are not presented in any sequence of merit and are referred to by short versions of their full site titles.