

## Mining

People have mined lead in the Peak District for thousands of years. There were numerous mines in the area of Middleton Dale and Eyam, many of which made use of the existing caves.

As mines were dug deeper flooding became a problem, so soughs (drainage tunnels) were dug and pumps used to take the water away. There were also lead smelters in the Dale. The garage on the edge of Stony Middleton stands on the site of one called Lord's Cupola (1740 – 1885).

The last mine in Derbyshire closed in 1939. Since this time many of the old lead mines and waste tips have been reworked for fluorspar, which previously was considered a waste product. Cavendish Mill to the south of Stony Middleton Dale processes fluorspar recovered from these sites.



## Quarrying

Limestone has been quarried since the Roman times for building stone and mortar. In the 19th century there were numerous small quarries extracting limestone. Each had its own lime kiln or they sent dry stone to Sheffield for the iron & steel industry. By the 1920s there were about a dozen quarries in the Dale and Eyam area with the lime kilns no longer in use. The modern quarries have destroyed most of the lime kilns, leaving just two partial kilns (marked on the map).

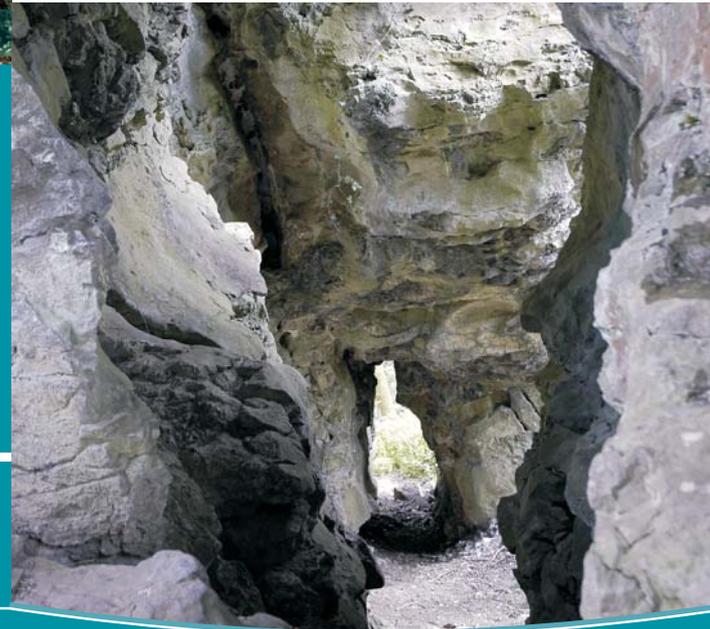
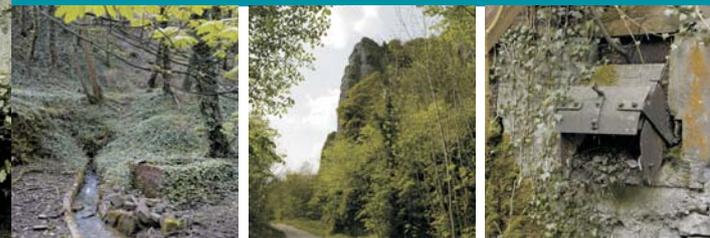


### Waterfall Swallet

The swallet is a tree lined sink hole, where a stream flowing across the impermeable shale falls as a spectacular waterfall. The water then disappears into holes in the limestone at the bottom of the depression. During times of flood this area fills with water and overflows into the nearby Waterfall Hole Cave. Water entering the swallet travels underground joining the stream in Middleton Dale.

The swallet is found at Grid Ref: SK199 771 on the Eyam/Foolow road. Parking is very limited and access is from an informal path.

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Caring for a living landscape

Geology of  
**Middleton Dale**  
Stoney Middleton



# Geology & Geomorphology

Middleton Dale is a deep limestone gorge. The limestone was formed 350-310 million years ago, in the Carboniferous period. At that time the Peak District lay close to the equator and was covered by a warm shallow sea. In the sea lived corals, brachiopods and crinoids. When these creatures died their remains fell to the sea floor, and over millions of years their shells and calcium-rich skeletons accumulated to become thousands of feet thick. The compression of the sediments turned them into limestone rock. Many years later the environment changed and river deltas covered the limestone with mud and sand that formed shale and gritstone.

Illustrated: Crinoid (sea lily) and limestone fossils of crinoids (broken stems).



Water deep within the rocks became heated by volcanic activity. This water contained dissolved minerals. As it circulated up through the joints in the limestone, it cooled and the dissolved minerals began to crystallise on the walls of the joints and cavities. This process occurred several times, creating layers of crystals until veins formed of galena (lead ore), fluorspar, barytes and calcite.

Over tens of millions of years the land mass moved slowly north. The forces involved caused the rock to be folded upwards forming the dome shape of the Peak District. This was followed by erosion of the overlying rocks exposing the gritstone, shale and limestone beneath.

Between 1.8 million and 10,000 years ago Britain was subjected to several periods of glacial activity. At the end of each glaciation fast flowing rivers, fed by the melt-water, carved out and deepened the valleys, forming the steep sided dales we have today.

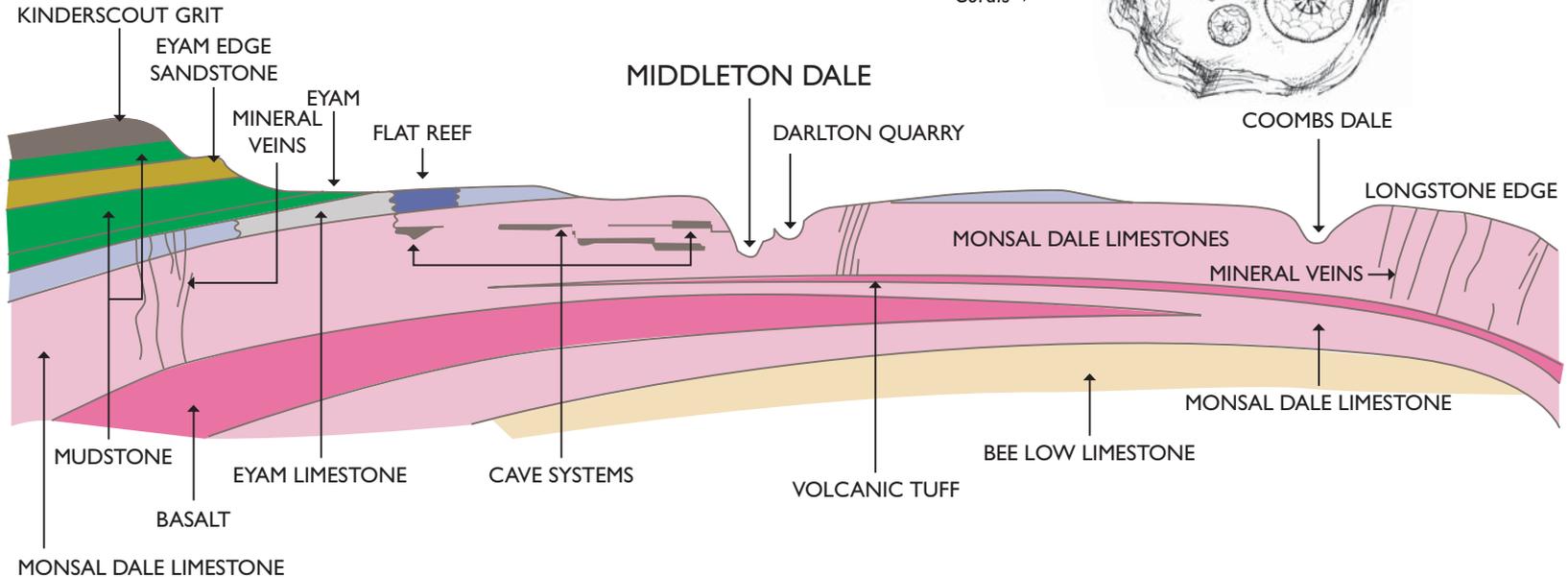
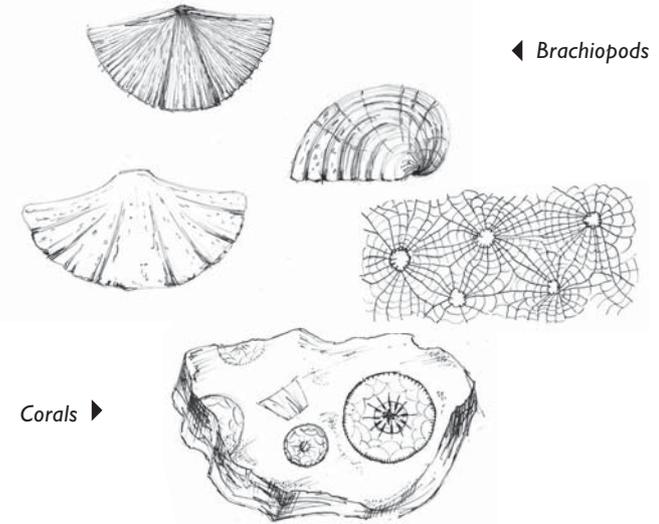
The caves within Middleton Dale show clearly that there were four distinct periods when melt-water flowed through the valley. Each time the valley was eroded, new cave systems formed deeper with in the limestone.

The water percolates through the joints in the limestone and, as natural water is slightly acidic, it gradually dissolves the rock. Slowly, tunnels and caverns form to create cave systems. The oldest network lies high in the cliff. The second is seen in the highest parts of the Carlswalk Cavern. The fourth and youngest caves are down at road level. Little is known about these, as they

are largely flooded. Each level formed where a thin layer of clay prevented any further downward percolation. The clay (known locally as toadstone) is formed from volcanic ash which settled on the seabed during the formation of limestone.

The stream in the Dale starts from Watergrove Sough (below Furness Quarry). Soughs are tunnels dug in the 17th and 18th centuries to take water away from flooded mines. Jumber Brook from Eyam Delf joins the stream to form Dale Brook, that runs adjacent to the main road.

Car parking is available in the lay-bys close to Rockwell Business Park and Furness Quarry (see map).



## 7. CUCKLET CHURCH & EYAM DELF

Eyam Delf is a small valley that leads up to the village of Eyam. High up the sides of the Delf are entrances to the oldest cave systems in the Dale, including the well known Cucklet Church. The Church is a cave that was largely destroyed by subsequent glacial melt-water which left it high and dry as the valley was further deepened. (Main image on cover: Cucklet Church).



## 8. FURNESS QUARRY

Furness Quarry was the only substantial quarry to be worked on the north side of the Dale. The others were excavated from the more gentle slopes on the southern side. The boundary between the Monsal Dale limestone and the Eyam limestone can clearly be seen near the top of the quarry face, separated by a layer of clay (known as toadstone). Most of the stone quarried here was used for road building and concrete. The quarry closed in 1969, but has recently been bought by the British Mountaineering Council (BMC) as a site for climbing.



## 4. SHINING CLIFF

The limestone is darker on the corner of Middleton Dale and Eyam Dale Road because it contains a lot of organic material. It is known locally as the black bed. If you look carefully there are fine fossil coral colonies, which stand out when the rock is wet.



## 5. DARLTON QUARRY

Darlton Quarry is still a working quarry. There is a public footpath (5A) up through the site to an interpretation board (5B), where there is a good view over the works.

## 6A. LIME KILN

From the bottom of Eyam Delf, remnants of a lime kiln can be seen at the entrance to Darlton Quarry. Lime kilns are used to burn limestone to make quicklime. This is used in cement, or can have water added to it to create slaked lime, which is used in agriculture as a soil improver.

## 6B. LIME KILN

Lime kiln entrance pictured here to your right.



## 2. FINGALL'S CAVE & CARLSWALK CAVERN

The vertical narrow entrance in the cliff is known as Fingall's Cave. It is an old mine and soon reduces down to a small passage. Around the entrance are traces of fluorspar and barytes, with occasional small pieces of shiny blue-grey galena (lead ore).

Close by is Carlswalk Cavern. This entrance (between the tree roots) is one of many into this cave system, but the most frequently



used by cavers. Further down the cliff towards the road is another one, known as the resurgence entrance. At times of flood a stream flows from it, causing problems on the road. Carlswalk Cavern is the most extensive cave system in the Dale and is popular with cavers. It is 3243m (10641 ft) in length and has a vertical range of 61m (200 ft).

## 3. FOSSIL SHELLS

The rocks close to the path contain an abundance of fossilised shells and during the spring and summer there is a profusion of wildflowers. There are also good views of Darlton Quarry.

**PLEASE NOTE:** Whilst many of the places mentioned in this leaflet are accessible from public rights of way or by established use, they all exist on private land. In all cases please respect the rights of the landowner/land manager and abide by the Countryside Code.

This site is designated a Site of Special Scientific Interest (SSSI) and fossil collecting is not permitted.

## 1. CASTLE ROCK

Approximately 200m up the path is Castle Rock, a double buttress in the cliff. Around it is Windy Ledge. The ledge is formed by the layer of limestone above being less resistant and therefore weathering away at a quicker rate. There is a network of caves at this level, one of which can be seen on Windy Ledge, through Castle Rock.

Looking up at the cliff face the layers or bedding places can be clearly seen. As environmental conditions in the sea changed, so there is a slight variation in the limestone. Also visible between here and Shining Cliff are several cave entrances, joints and traces of minerals.

Inset picture: Engraving of Castle Rock by F.L. Chantry, 1818. With thanks to Derbyshire County Council - Buxton Museum and Art Gallery.

