

# Rocks and Landscapes of Ogden Clough, Halifax



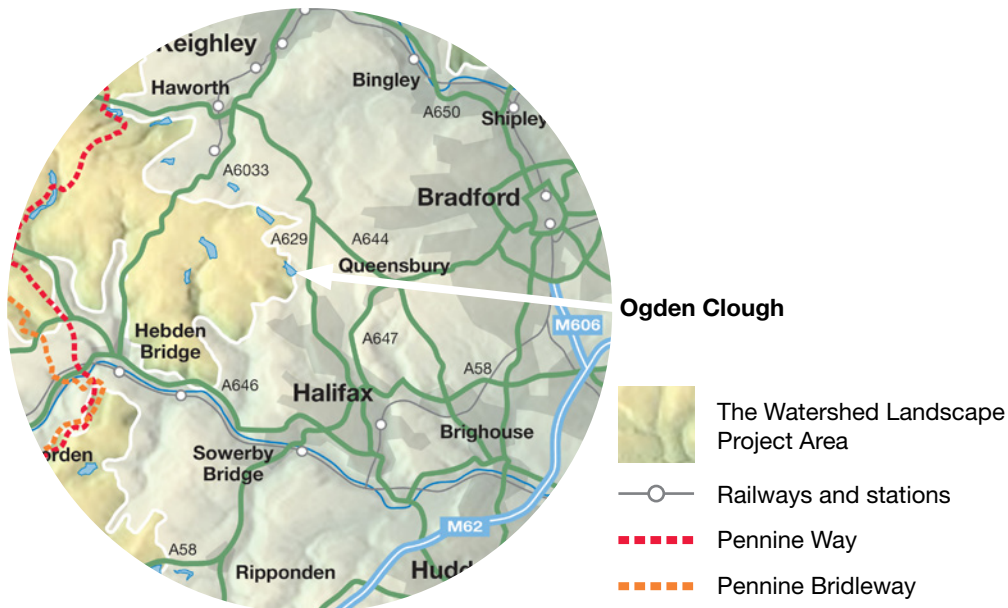
A group on a guided walk, looking at rock features in Ogden Kirk Quarries.



Ogden Clough Local Geological Site (LGS) lies to the north of Halifax, two miles to the west of Queensbury. Ogden Water is a reservoir built in the Hebble Brook valley which, for many years, has attracted visitors wanting to enjoy the wonderful countryside in the area. There is a car park and picnic site at SE 064 309 and a small café staffed by volunteers close to the Ogden Water dam.

Ogden Clough is a very steep-sided valley cut by the Hebble Brook to the north of Ogden Water. It contains some interesting rock and landscape features and is a very attractive area. The track from the car park on the north side of the clough leads to Ogden Kirk quarries, which are disused and have interesting rock exposures. There is a footpath crossing the top of Ogden Clough and leading onto Ovenden Moor. The footpath which follows the stream down Ogden Clough is not a public right of way and is not maintained, so it is not advised that visitors walk down the valley.

From the track and footpaths near Ogden Kirk there are excellent views to the south across the Halifax area, which show how the Pennine landscapes are related to the rock types. Sandstones and mudstones can be seen and there are some very good examples of plant fossils on some of the boulders in the Ogden Kirk quarries.



The LGS is near to the protected Ogden Water Woodland and Nature Reserve and part of it lies within the South Pennines SSSI protected area.

## Ogden Kirk quarries

You can reach the quarries by walking below the main track on small footpaths, though take care near to the quarry faces. It is best to look at the loose boulders near the path, rather than go too close to the steep quarry faces. The rocks in the disused quarries above Ogden Clough are **sandstones** called the Rough Rock by geologists, and they are part of the **Millstone Grit** group of Upper Carboniferous age. They date from about 310 million years ago.

**Sandstone** is a sedimentary rock which is made up of sand grains. The sand grains are formed by the breakdown of pre-existing rocks by weathering. The composition of sandstone can vary, as a large number of different **minerals** may occur within the sediment which makes up the rock. The most common mineral is grey **quartz**, which is very resistant to weathering. **Feldspar** is a cream or white mineral and **muscovite mica** is white and reflects light like a mirror. Both minerals are hard to see in sandstone without using a hand lens or a magnifying glass.



A fresh piece of sandstone with orange bands of iron oxides.

Some sandstones are called **grits** or **gritstones** because their sand grains are large and angular, which gives the rock a gritty and rough texture. The Rough Rock of Ogden Clough is a coarse gritstone with angular sand grains.

The rocks formed during Upper Carboniferous times are formed from sediments deposited in deltas or river channels, close to sea-level. For sand grains to become a sandstone, they must be **compacted** to squash water out and the sand grains must be **cemented** together by minerals. Quartz, calcite and iron oxides are the most common cementing minerals. They are deposited in the spaces between the sand grains by water moving through the sediments and, over time, these minerals fill up the spaces by crystal growth. Iron is usually present in the cement, so that sandstones take on a reddish, yellow or brown colour, when the rock is freshly broken.

You should be able to see **plant fossils** in excellent condition on fallen boulders in the two quarries, as shown in the photo below. These plants belong to the club moss family, and are predominantly of the species *Calamites*. Most of the plant remains lacks smaller branches or leaf material, suggesting that they have been transported within a turbulent river in flood and then dropped on the sandbanks when the floods receded.



Plant fossils in a large boulder in Ogden Kirk Quarries at SE 0560 3164.

Plant fossils show that large rivers flowed through forests growing in deltas or river basins, such as the present Amazon basin during Carboniferous times. There is a small coal seam on Soil Hill nearby, which developed as plant material died and fell into lakes or swamps. It was buried by more sand and mud and compressed, driving out water and gases, leaving only the carbon from the plants which formed the coal seams that are found in the Halifax area.

## Ogden Clough

If you walk from the quarries down into the valley to where the Ovenden Moor footpath crosses the Hebble Brook, you can see some black rocks on the opposite river bank at SE 054 318.

These rocks are **mudstones** (often called **shales**) and they are a sedimentary rock made of **clay particles**. **Clay** is the finest of sediments and can only be observed through a high powered microscope. The small size and plate-like shape of clay particles means they remain in suspension in water currents in lakes, rivers or seas and are only deposited when water flow is extremely slow-moving or stationary.



Dark coloured mudstones in the bed of the Hebble Brook in Ogden Clough. The thin beds are the laminations.



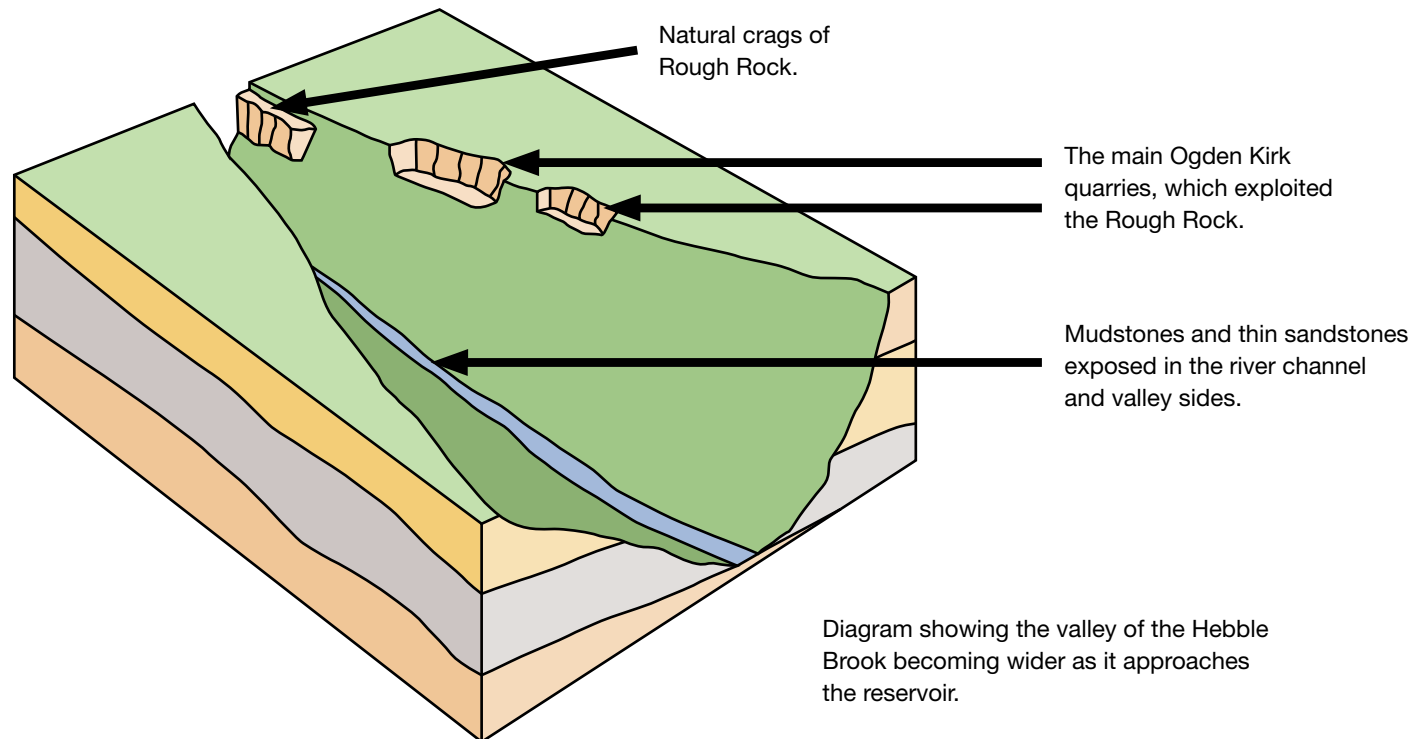


Yellow tufa is encrusting the mudstones and plants next to the stream.

Once clay particles come into contact with each another, they tend to stick together because they are cohesive. Over time, clay particles build up and are compressed into thin beds called **laminations** and form a solid rock which can be grey or black.

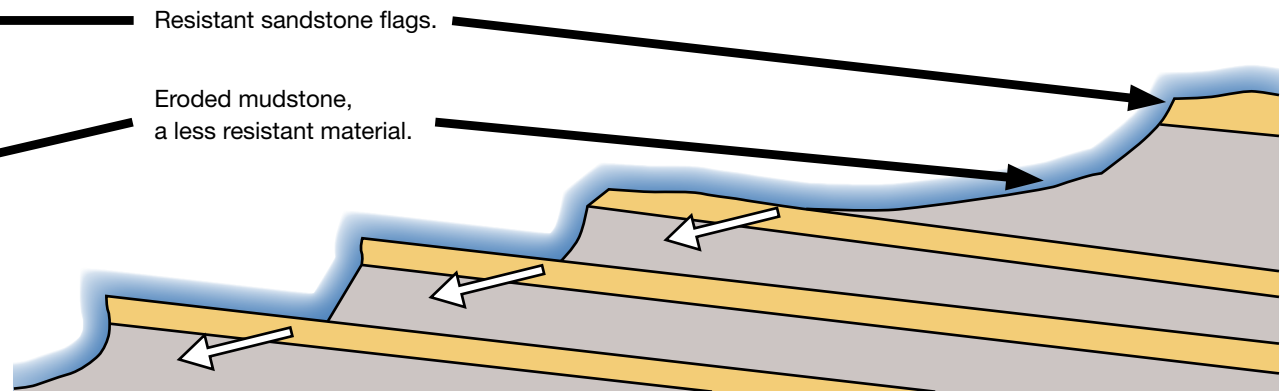
Close to this point, a deposit of yellow **tufa** can be seen. Tufa is a calcium carbonate mineral formed from ground water moving through the rocks picking up calcium carbonate. The calcium carbonate possibly originates from fossil shells. When the ground water mixes with air at a waterfall, the calcium carbonate mineral is precipitated and covers moss and rock faces. Tufa is an unusual deposit and should not be damaged.

The Hebble Brook has carved the Ogden Clough valley. This river channel has been influenced by the bedrock over which it flows to form a beautiful set of rapids and waterfalls. The diagram below shows how the clough has been formed by the river which is eroding into nearly horizontal beds of sandstones and mudstones.





This photograph and diagram show the mechanics of the Ogden waterfalls. The river channel demonstrates this very clearly and is an important feature of Ogden Clough.

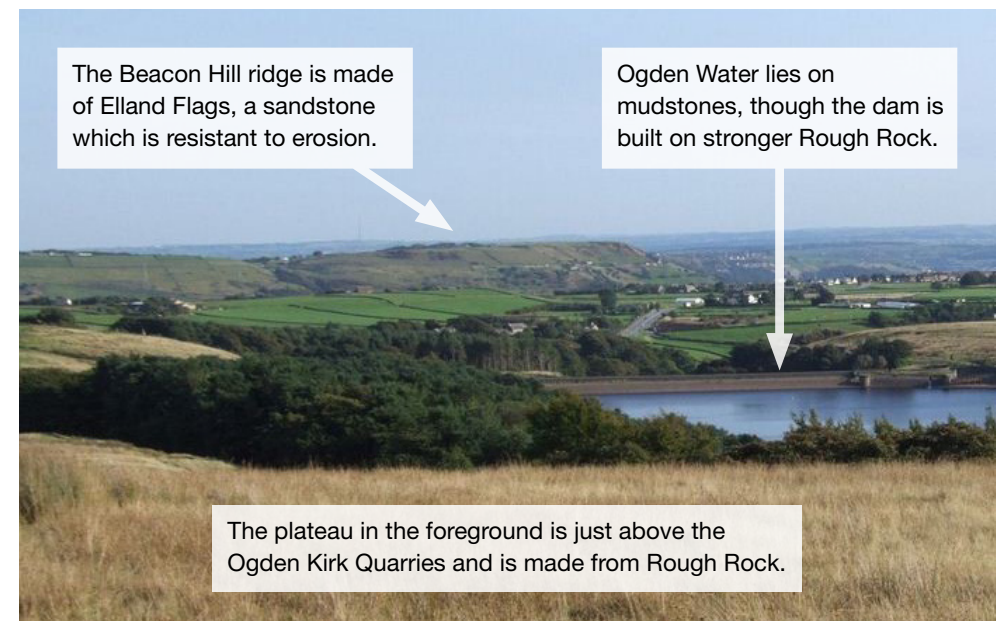


The river flows down a considerable gradient and has produced a steep-sided valley in which the bedrock geology is exposed. The valley becomes wider until it reaches the reservoir. Because the river flows over alternating sandstones and mudstones, an impressive series of small waterfalls and rapids has been eroded. The sandstones are more resistant to erosion, but the mudstones are easy to wear away by water because of the many laminations which allow the force of the water to break off small sections. This has produced a series of waterfalls as shown in the photograph above.

### Landscapes of the Ogden area

The photo on the right is taken from Ogden Kirk quarries above Ogden Water looking towards the south. It shows the landscape features of the Halifax area.

Beacon Hill, in the middle of the photo, lies above Halifax and is made up of resistant sandstones, the Elland Flags. The landscape shows near-horizontal benches which are formed from sandstones, whereas the valleys lie in areas where less resistant mudstone (shale) has been eroded by rivers.





## Economic geology

Evidence of quarrying activity can be seen in all the disused quarries. The photo below shows a quarry face with horizontal beds which the quarrymen could use to extract the stone easily. In some places boreholes can be seen in the rocks. These show where the quarrymen have used plugs and feathers to split the rock, as shown in the photo on the right.

The fallen blocks in the quarries also show why the stone is a suitable building material. It is strong enough to be used for building large structures, such as the dam across the Hebble Brook near the top of Ogden Clough.

The coarse sandstone of the Millstone Grits was famously used as grinding gear in barley mills. A close examination of the rock indicates why this coarse, angular-grained sandstone was ideal for such an industrial application.



Face of Rough Rock sandstone in the Ogden Kirk quarries.



Plugs and feathers placed in boreholes ready for the quarryman's hammer to split the rock.

## Acknowledgements

Peter Nixon of WYGT who surveyed Ogden Clough and wrote a report in 2011 from which much of this material is taken

Photos © Alison Tymon and Peter Nixon

## References

Wray, D A, Stephens, J V, and Bromehead, C E N, 1930, *Geology of the Country around Huddersfield and Halifax*, Geological Survey Memoir

Addison, R, Waters, C N, and Chisholm, J I, 2005, *Geology of the Huddersfield District*, Sheet Description of the British Geological Survey, 1:50,000 Series Sheet 77 Huddersfield

## Useful maps

OS SHEET 1:50,000 Landranger 104 Leeds and Bradford

OS SHEET: 1:25,000 Explorer OL21 South Pennines

British Geological Survey 1:50,000 Geological Sheet 77 Huddersfield

Written by Alison Tymon © West Yorkshire Geology Trust 2013

**[www.wyorksgologytrust.org](http://www.wyorksgologytrust.org)**

West Yorkshire Geology Trust (WYGT) is an active group of volunteers, whose aim is to promote geodiversity in the five districts of Bradford, Calderdale, Kirklees, Leeds and Wakefield. Our objectives are to maintain a data base of Local Geological Sites (such as Ogden Clough) in the five districts and to provide information for local authorities and other statutory bodies. We also promote geology for the general public, using guided walks and activities for children and adults. We write and produce interpretation boards and leaflets for some of the important Local Geological Sites, as well as maintaining an informative website.

This leaflet has been produced with support from the Watershed Landscape Project, a three year Heritage Lottery Funded project managed by Pennine Prospects to enhance and conserve the South Pennine upland landscape and its heritage, whilst improving access for all.

The aims of the project are to protect the internationally important natural and historic features of this special landscape and to encourage greater understanding and enjoyment of the area so that it is further valued and protected. The project has been telling the fascinating stories of the moors by offering opportunities to get involved in local heritage projects, delivering moorland conservation initiatives, developing resources to help people explore the landscape, hosting exciting events and activities, and working with artists and writers on an original creative arts programme.

For more information about the Watershed Landscape Project please visit

**[www.watershedlandscape.co.uk](http://www.watershedlandscape.co.uk)**