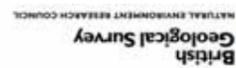
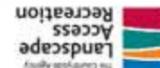




NORTH PENNINES

Area of Outstanding Natural Beauty



Produced by North Pennines AONB Partnership and the British Geological Survey with the financial assistance of Heritage Lottery Fund, English Nature and the Countryside Agency. Thanks to Brian Young, British Geological Survey. For further information about Upper Teesdale, including public transport, contact Middleton in Teesdale TIC: 01833 641001



This trail is within the North Pennines Area of Outstanding Natural Beauty (AONB), one of England's wildest and most special places. The North Pennines AONB is also Britain's first European Geopark and a founding member of the UNESCO Global Geoparks Network. To find out more, contact the North Pennines AONB Partnership on 01388 528801 or visit www.northpennines.org.uk. Please be aware that there are deep mine shafts in this area. Please follow the Countryside Code, in particular keep dogs on a lead to avoid disturbance to ground nesting birds and grazing livestock. Please do not camp or light fires.

Holwick Scar & Low Force Geological Trail



Holwick Scar & Low Force Geological Trail

This short circular walk is approximately 4 kilometres long. It uses well-marked footpaths and a short length of minor road. Stout shoes or boots, warm clothing and good waterproofs are advised, as even in summer the weather in Teesdale can be harsh and can change suddenly.

The route crosses farmland where stock may be grazing. In other places it runs close to the River Tees and passes several old mine workings. Please keep to the footpaths, be especially careful near to the river and on road crossings, and do not attempt to enter mine workings. Do look closely at the rocks along the way, but please do not hammer or attempt to collect them. Please leave them for others to enjoy.

The walk will introduce you to some of the natural landscape features which make this one of the most beautiful parts of Teesdale. Look out for interpretation panels along the way that highlight how the landscape has evolved.

Useful maps:

Ordnance Survey

1:25 000 Explorer OL31 North Pennines Teesdale and Weardale

British Geological Survey

1:25 000 Geological Sheet NY82 and part of NY92 Middleton-in-Teesdale

1:50 000 Geological Sheet 25 Alston

You can start this walk from one of three places:

The Strathmore Arms car park, (NY909 268)

The Farmhouse Kitchen at Low Way Farm (NY911 267). At weekends, please only use the Farmhouse Kitchen car park if you intend to eat there.

Bowlees Visitor Centre (NY908 282).

Starting from The Strathmore Arms or Farmhouse Kitchen, walk west along the minor road towards Holwick Lodge.

From Bowlees Visitor Centre, walk down the lane to the main road. Turn right and after 20 metres take care crossing the road to a wicket gate. Follow the footpath to Wynch Bridge. From here, follow the directions for stopping point 5 (marked *).

1 Holwick Scar

On your left, the bare grey crags of Holwick Scar are part of the outcrop of the Whin Sill. This is a roughly horizontal sheet of the dark grey igneous rock called dolerite. It was injected into the surrounding rocks as liquid rock, or magma, about 295 million years ago. Notice the roughly vertical cracks which break the rock into irregular columns. These formed as the Whin Sill finally cooled and contracted. Columnar jointing of this sort is common in rocks like this. Especially good examples include the Giant's Causeway and Fingal's Cave. Notice the drystone walls alongside the road. They contain many angular blocks of dolerite collected from the broken outcrop of the Sill.



2 Drumlins

About 700 metres from the car park, follow the tarmac road to the right. Stop and look back down the valley.

Notice how the fields to the north of the Holwick road are smooth and appear to be moulded into round egg-shaped mounds, in contrast to the rocky Holwick Scars. These smooth fields stand on boulder clay, the debris left by ice sheets during the last glacial period which ended here when the ice finally melted only about 11,000 years ago. Such rounded hills are called 'drumlins'. They were shaped by the ice sheets passing across them and smoothing, or streamlining, the boulder clay in the direction of flow. The ice here flowed down the valley.

Continue to a cattle grid where the road passes through a gate and bears left for Holwick Lodge.



3 Clearance stones

Leave the road and take the footpath due north across the grassy fields and head towards a stile in the wall ahead.

You are now walking across smooth boulder clay-covered ground. Notice that the wall is built almost entirely from rounded boulders, in contrast to the many angular blocks seen in the walls earlier in the walk. These boulders are 'clearance stones', which have been gathered from the surrounding fields. They are boulders from the boulder clay. Their smooth shape is the result of having been ground relentlessly against other boulders and sand as they were carried by the ice sheets.

Follow the footpath to the river bank at Wynch Bridge.



4 Wynch Bridge and Low Force

The present bridge replaces an earlier one built for lead miners from Holwick to cross the river to work in the mines on the north side of Teesdale.

Immediately upstream from the bridge is Low Force, a waterfall over an outcrop of Whin Sill. The same rock crops out in the deep gorge beneath the bridge and forms the river bed for several metres downstream.

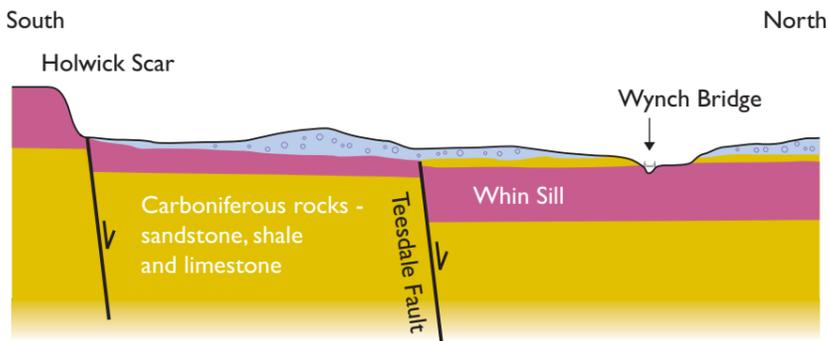
Cross the bridge and follow the footpath to Bowlees. About 100m on from the bridge the path rises steeply to a stile in a drystone wall.

The steepening slope marks the top of the Whin Sill. Sandstone, baked by the great heat of the molten rock (about 1,100°C), can be seen in the path here. At Holwick Scar we discovered that the Whin Sill is a roughly horizontal sheet of rock, yet here at Wynch Bridge we are standing on its top. How can this be?

The reason lies beneath our feet. Running along the length of Teesdale are several large faults, including the Teesdale Fault, cracks in the Earth's crust adjacent to which the rocks have been displaced. The rocks on the north have been moved down more than 100 metres relative to those on the south. As a result, the top of the Whin Sill lies close to the river level at Wynch Bridge, but lies above the top of Holwick Scar.



Climbing the Whin Sill!



Sketch section to show displacement of the Whin Sill (not to scale).



5 Dolerite boulders

At the stile, look at the large rocks which form its sides. They are boulders of dolerite from the local boulder clay. If you look carefully you will see prominent grooves, or scratches, lying vertically on the surfaces of these boulders. These are the remains of deep scratches, or 'striations', caused by the boulders being ground together as they were dragged along by the ice sheets.



You can carry on to Bowlees Visitor Centre. Take care crossing the road and follow the lane straight ahead. Retrace your steps to Wynch Bridge. * Cross the bridge and immediately turn left (downstream) along a narrow rocky path.

6 Whetstone

A few metres along this path a wide rocky area, with an upstanding mass of rock, opens up on the left between the path and the river.

Notice that the rocks here show a distinct layering, or bedding, which is inclined steeply towards the river. This is a mass of sandstone and shale from above the top of the Whin Sill. As the Sill was being injected, this mass broke off as a large slab and sank into the intensely hot liquid rock where it was severely baked. The sandstone became harder; the shale was turned into a fine-grained rock, known to miners as 'whetstone', and to geologists as 'hornfels'.

Continue alongside the riverside path towards Scoberry Bridge.



7 Mineral workings

More baked sandstones and shales, which lie above the Whin Sill, can be seen in places adjacent to the path, and in the river bed.

At several places, in the fields on the right hand side of the path, you will see small but conspicuous piles of broken rock. These are the spoil heaps from trial mines driven into the hillside to explore small mineral veins. Although the miners would originally have been in search of lead ore, the veins here contain almost no lead, but lots of zinc and iron. Further exploration for zinc ores was done here during the 1940s, but the deposits found were not large enough to be worked. The gated-off entrances of some of the tunnels may be seen close to Scoberry Bridge. **Please do not enter these fields or attempt to explore the mines.**

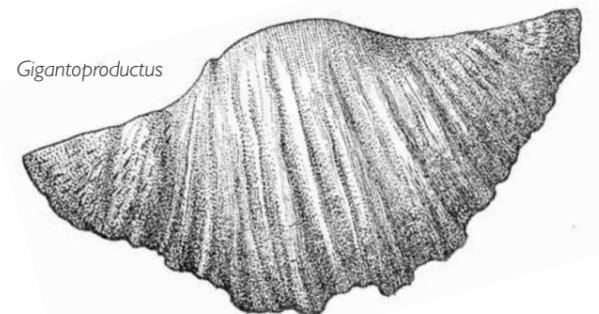
8 Fossils!

Cross Scoberry Bridge and immediately turn right to a large area of flat grey rock by the river bank.

This is a fine outcrop of a limestone called the Cockleshell Limestone. A little searching will soon reveal the reason for its name. Large white fossilised shells can be seen on the smooth, water-worn surfaces. These are shells of the extinct brachiopod called *Gigantoproductus*. Also conspicuous are long cylindrical remains of crinoids, animals related to modern sea urchins and star fish. These, and many other creatures, lived here almost 350 million years ago, during the Carboniferous Period, when the North Pennines lay under a warm, shallow tropical sea (thousands of miles south of its current position).

You can learn more about this, and see a reconstruction of a Carboniferous sea floor, at the Bowlees Visitor Centre (also part of the Teesdale Time Trail).

Cross back over the bridge and follow the track across the fields towards the starting point.



9 Aluvial deposits

The first few metres of the path cross flat-lying alluvial deposits laid down by the River Tees in times of flood. The path soon climbs above this level and crosses undulating boulder clay country en route to the Holwick road.

From where the path joins this road retrace your steps, perhaps for some well-earned refreshment at the Strathmore Arms or Farmhouse Kitchen.

We hope you have enjoyed this walk, and learnt a little about the local rocks and landscape. There is much more to explore here and throughout the North Pennines Geopark. For more information about leaflets, events etc. please contact the AONB office.