

1 Wynch Bridge and Low Force

Just upstream from the bridge is the series of waterfalls that make up Low Force. Here, the River Tees tumbles over the hard dolerite of the Whin Sill, which also forms the rocky gorge beneath the bridge.

The bridge dates from 1830 and replaces an earlier one which collapsed in 1802. The bridge was originally built so that lead miners from Holwick could cross the river to work in mines on the north side of Teesdale.

Cross the bridge and turn left. Follow the path a short way along the river.

2 Baked rocks

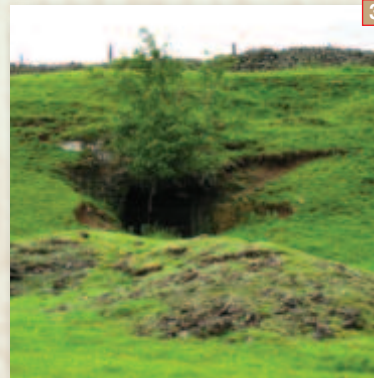
On your left, between the path and the river, is an upstanding mass of rock. This is dolerite – part of the Whin Sill – but at its base you'll see different, layered rocks. These are sandstones and shales which were once above the Whin Sill. When the Whin Sill was molten, this slab of layered rocks sank down into it and was severely baked. The sandstone became harder and the shale turned into a hard, fine-grained rock known to miners as whetstone and to geologists as hornfels.



3 Minerals and mines

In the fields on your right there are two gated mine entrances and some small spoil heaps. These are old trial mines for exploring several minor mineral veins. The miners were originally looking for lead ore, but there is very little in the veins here. The veins are, however, rich in zinc and iron ores. Despite further exploration for zinc ore in the 1940s, the deposits were not large enough to be worked economically.

Continue to Scoberry Bridge. Cross the bridge and turn right to a flat area of rock beside the river.



4 Fossils

This is a fine outcrop of the Cockleshell Limestone. If you look at the water-worn surfaces you'll see why past quarrymen and miners gave it this name. The curved white shapes are fossil shells of an extinct brachiopod called *Gigantoproductus*. You can also find corals and crinoids (animals related to modern starfish). These creatures lived here about 330 million years ago, in the Carboniferous Period, when the North Pennines was covered by shallow tropical seas.

Cross back over the bridge and follow the footpath across the fields to Holwick.



5 Ancient settlement

Just before the stile, there are the remains of a medieval house, visible as a rectangle of low grassy ridges. This is one of many such sites, showing that people have lived and worked here for thousands of years. Archaeological evidence also shows that there was a thriving iron smelting industry, dating back to prehistoric times, using local iron ore.

Go over the stile and turn right to follow the road.



6 Holwick Scars

This is one of the best places to see the Whin Sill. The cliffs here contain vertical cracks along which the rock breaks into rough columns. This feature formed when the once-molten rock cooled and contracted.

The Whin Sill formed as a roughly horizontal sheet, but it has since been broken up by faults – cracks in the Earth's crust along which the rocks have been displaced. Several faults run along Teesdale. The rocks to the north have been moved down 100 m relative to those here. This is why the top of the Whin Sill is near river level at Wynch Bridge, but lies above Holwick Scars.

Follow the road to a junction and turn right.



7 Shaped by ice and water

Holwick Scars have been sculpted to their present shape by ice and water. In the last ice age, a huge ice sheet streamed over the landscape, eroding areas such as these cliffs. Torrential meltwaters caused further erosion. The rock debris, or scree, at the base of the cliffs has formed since the ice melted. It continues to build up today, as rock fragments break off by the alternate freezing and thawing of water in cracks in the rock.

8 Drumlins

The rounded grassy hills around Holwick are also a legacy of the last ice age. They formed when ice flowed down Teesdale and shaped glacial debris known as till into smooth, streamlined mounds called drumlins.

Continue to a cattle grid. Turn right off the road and follow the footpath across the meadows.



9 Stones in walls and buildings

Many of the dry stone walls around Holwick are made of rounded boulders. These are clearance stones, gathered from the fields. They came out of the glacial till and their rounded shapes are the result of having been ground against other boulders as they were carried by ice.

These contrast with the angular blocks of sandstone used to make most North Pennine walls and buildings like the field barn you can see. This stone was quarried locally and shaped into blocks.

Follow the footpath back to Wynch Bridge and return to Bowlees.



For a pleasant short extension...

To see more geological features there's an easy short walk (½ hour return) from the car park to Gibson's Cave. Head north out of the car park past the toilets and follow the path. After passing an old limestone quarry, you'll come to the lovely waterfall of Summerhill Force at Gibson's Cave. Return by the same route.



Welcome to a special landscape...

...shaped by millions of years of natural processes and thousands of years of human activity.

The landscape around Low Force and Holwick in Upper Teesdale has been over 300 million years in the making. From tropical seas and molten rock to glaciers, minerals and miners – all have played their part in shaping this beautiful landscape.

This circular walk will introduce you to some of the special features of the landscape around Low Force and Holwick. By spotting clues in the fields, walls, crags and River Tees you'll find out how to read the landscape and discover more about its fascinating past.

The sections opposite describe how the local rocks and minerals formed and how the landscape was shaped by ice.

Walk length/time: Approx. 4 km (2½ miles) with 65 m of ascent, taking about 1½ hours

Start/finish: Bowlees car park
Grid Reference NY 908 282

Terrain: This route follows public footpaths, with several stiles, and a short stretch of minor road. The route is mainly on paths through fields and beside the River Tees. Walking boots or strong shoes are recommended. Please keep to the footpaths and leave gates as you find them. Please keep dogs under close control (on a lead through farmland with livestock) and be careful near the river.

Public transport: For timetable information call Traveline on 0871 200 2233 (www.traveline.info)

Facilities:

Bowlees: Car park and toilets

Holwick: The Strathmore Arms and the Farmhouse Kitchen at Low Way Farm (both are a short distance off the route)

Useful maps:

Ordnance Survey

1:50 000 Landranger 91 Appleby-in-Westmorland or 92 Barnard Castle & Richmond

1:25 000 Explorer OL31 North Pennines

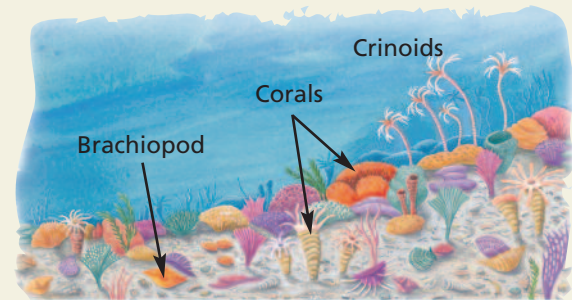
British Geological Survey

1:50 000 Geological Sheet 31 Brough-under-Stainmore

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

Tropical North Pennines

The rocks that make up most of the North Pennines are layers of limestone, sandstone and shale. They formed in the Carboniferous Period, 360 to 300 million years ago, when the North Pennines lay near the equator. Limy ooze, sand and mud in tropical seas and deltas hardened into the limestone, sandstone and shale we see today. As you'll discover on this walk, some of these rocks contain fossils which tell us about life in the distant past.

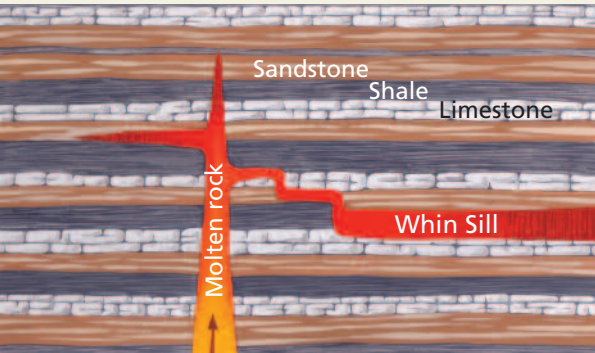


A Carboniferous tropical sea and some of the creatures now preserved as fossils

The Whin Sill

The Whin Sill is one of the special geological features of the North Pennines and forms dramatic landscapes in Upper Teesdale, as you'll see on this walk.

Stretching of the Earth's crust 295 million years ago caused molten rock at over 1000°C to rise up and spread out between the layers of Carboniferous rocks. It cooled and solidified underground to form the Whin Sill, a vast, roughly horizontal sheet of a hard dark rock called dolerite (known locally as whinstone). After millions of years of erosion the Whin Sill is now exposed at the surface in several places.

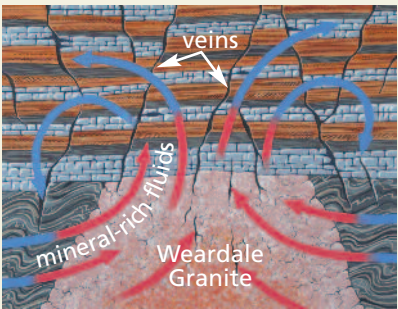


Formation of the Whin Sill

Buried treasure

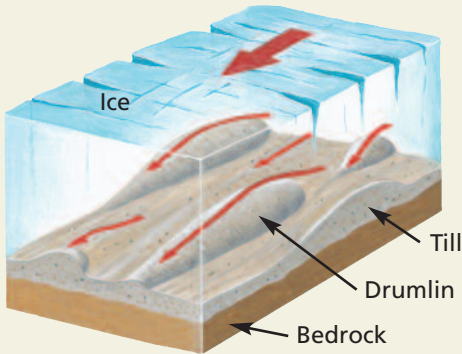
The North Pennines is famous for its mineral deposits. These formed about 290 million years ago, from mineral-rich waters which flowed through cracks in the rocks deep underground. These solutions were heated by a buried granite known as the Weardale Granite. As the fluids cooled, their dissolved minerals crystallized on the walls of the cracks, building up mineral veins and deposits.

These mineral deposits were the foundation of the local economy for many centuries. Mining for lead ore was the most important industry, but many other minerals were also mined at different times. On this walk you'll see some old trial mines.



Sculpted by ice

The North Pennine landscape also owes much to the action of ice and meltwater in the more recent geological past. In the last ice age, about 20,000 years ago, the North Pennines lay frozen under a huge sheet of ice which scoured and smoothed the fells and dales. The ice dumped a mixture of clay, gravel and boulders known as till and shaped it into streamlined hills known as drumlins, which you'll see around Holwick.



Formation of drumlins under flowing ice

Low Force and Holwick are in the North Pennines Area of Outstanding Natural Beauty (AONB) and Global Geopark

UNESCO Global Geopark

The North Pennines is a UNESCO Global Geopark. These are places that have outstanding geology and landscape, where there are strong local efforts to make the most of Earth heritage through interpretation, education, conservation and tourism. To find out more visit www.globalgeopark.org

Moor House – Upper Teesdale National Nature Reserve (NNR)

Part of this walk (south of the River Tees near Low Force) is within the Moor House – Upper Teesdale NNR. This large reserve contains an almost complete range of upland habitats typical of the North Pennines, from hay meadows and juniper woods to limestone grassland and blanket bog. It also includes the waterfalls of Cauldron Snout and High Force. For more information contact the Reserve Base on 01833 622374.

Find out more about North Pennine geology

This leaflet is one of a series of geological publications about the North Pennines. These are part of the North Pennines AONB Partnership's work to make the most of our special geological heritage. This work includes children's geology clubs, evening classes, geological trails, events, publications and much more...



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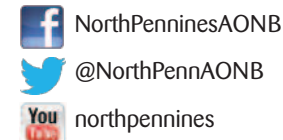
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The North Pennines is one of England's most special places – a peaceful, unspoilt landscape with a rich history and vibrant natural beauty. In recognition of this it is designated as an Area of Outstanding Natural Beauty (AONB). The area is also a Global Geopark – an accolade endorsed by UNESCO.

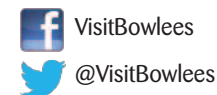
A 2½-mile walk exploring the landscape, rocks, fossils and mines around Low Force and Holwick.

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Low Force and Holwick

Rocks, fossils and mines



NORTH PENNINES
Area of Outstanding Natural Beauty



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