# Tynehead Geological Trail

Approximately 3.5km long, this trail uses the South Tyne Trail and well-made tracks. It is at its best in summer when the water levels in the South Tyne are usually low. However, good boots, warm clothing and waterproofs are strongly advised, even at this time of year.

This trail will introduce many of the rocks that give the landscape of the North Pennines its unique character. The route crosses a number of mineral veins that were once worked commercially and the remnants of mining operations can be seen in several places. Many of the old workings may be unstable - please keep to the footpaths and do not attempt to enter old tunnels or surface excavations. Do examine the rocks and minerals you will see along the route, but please do not collect them: leave them for others to enjoy.

**Useful maps:**

Ordnance Survey
*1:25 000 Explorer OL31 North Pennines Teesdale and Weardale*

British Geological Survey
*1:50 000 Geological Sheet 25 Alston*

There is limited car parking space at the end of the unclassified road from Garrigill.
Please park sensitively.

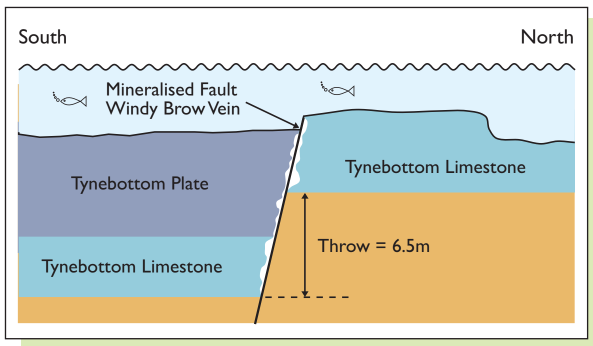
From the end of the road, follow the south-eastern footpath, signposted Yad Moss, that leads downhill towards the river at Dorthgillfoot. Cross the river and follow the path downstream for 50m to a waterfall about 1m high.

## 1 By the bridge

Two different rocks form the riverbed on the downstream (north) side of the bridge. Furthest from the bridge, the rocks look like large, flat, blue-grey slabs. These rocks are the Tynebottom Limestone, one of many beds of limestone of which the North Pennines are built. If the water levels are low, small tube-shaped fossils are visible in the limestone; these are crinoids, sea creatures related to sea urchins. The limestones were formed as layers of soft limey mud on the floor of a shallow tropical sea, about 330 million years ago, during the Carboniferous Period of Earth history. At this time, the area that was to become the North Pennines lay almost astride the equator. The Tynebottom Limestone is named after this section of river as the limestone forms much of the bed of the river between here and Garrigill.

As you walk back towards the bridge, you will notice that the rock forming the riverbed and west bank abruptly changes, appearing dark-grey and crumbly. This is shale, known to the miners as the Tynebottom Plate. 'Plate' was a miners' name for shale. Shales of the North Pennines formed from mud that accumulated on the floor of the Carboniferous sea. Rocks such as these, formed from sediments, are known as sedimentary rocks. Much of the North Pennines consists of regular alternations of beds of limestone, shale and sandstone on top of one another. The sandstone beds formed from sand washed into the Carboniferous sea by rivers (sandstone is not visible here).

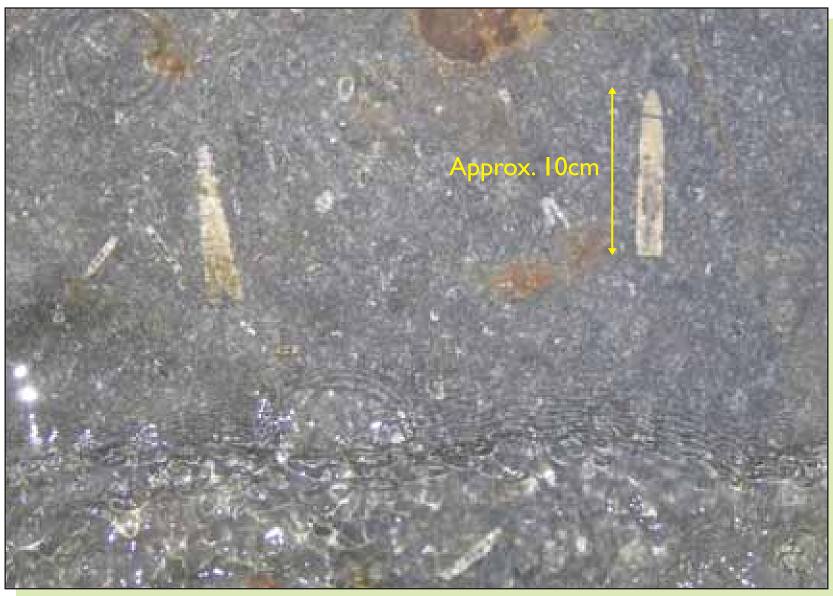
Normally, the Tynebottom Plate overlies the Tynebottom Limestone. Here we see them next to each other with an abrupt change from one to the other. The change occurs at a fault, or break in the rocks. The rocks upstream of this fault have moved downwards relative to those downstream, placing the Tynebottom Plate next to the Tynebottom Limestone. At this locality, the throw (or amount of vertical displacement) on the fault is about 6.5m.




This fault is mineralised and is known as the Windy Brow Vein. Across the valley, to the east, the vein consists mostly of quartz with galena (lead ore), some pyrite (fool's gold) and a little chalcopyrite (copper ore). It was worked at Windy Brow and near Tynehead Farm. Here, at Dorthgillfoot, the vein contains few ore minerals but consists mostly of well-crystallised quartz and some calcite. The tunnel entrance to Dorthgillfoot Mine, visible here in the west bank under the track, leads to workings in this and other small veins.

Mineral veins of the North Pennines were formed about 290 million years ago, as warm waters, rich in dissolved minerals, flowed through cracks and faults, driven by heat deep beneath the surface. As these solutions cooled, the dissolved minerals crystallised on the walls of the faults to form mineral veins.

Walk back towards the bridge and the junction of Clargill Burn and the South Tyne. Walk up the track. About 200m after Tynehead Farm, cut down to a small waterfall in Clargill Burn.




*Crinoid fossils in Tynebottom Limestone*

# Tynehead
## Geological Trail

quaternary tertiary cretaceous jurassic triassic permian carboniferous devonian silurian ordo

## Tynehead

This trail is adjacent to Moor House-Upper Teesdale National Nature Reserve (NNR), an internationally important place for wildlife and earth heritage. The NNR is managed by English Nature (the Government body which looks after our natural heritage) in partnership with Raby and Strathmore Estates and local farmers.

Safety: the weather can deteriorate rapidly - carry weather proof clothing and know how to use a map and compass.

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.


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


Thanks to Stuart Clarke, BGS


English Nature Northumbria Team Office: 01661 845500
Moor House-Upper Teesdale Reserve Base: 01833 622374
www.english-nature.org.uk

For further information about the area, including public transport, contact Alston TIC: 01434 382244.


Produced by North Pennines AONB Partnership, British Geological Survey and English Nature, with the financial assistance of English Nature, Heritage Lottery Fund and the Countryside Agency

NORTH PENNINES AONB PARTNERSHIP
Working together for the North Pennines
British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL
ENGLISH NATURE
Supported by the Heritage Lottery Fund
The Countryside Agency Landscape Access Recreation


NORTH PENNINES
Area of Outstanding Natural Beauty

UNESCO GLOBAL GEOPARKS NETWORK
European Geoparks

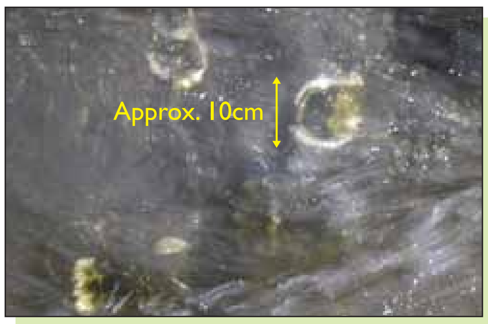
## 2 Small waterfall

The rocks in the waterfall are the next limestone up in the succession: the Cockleshell Limestone. It contains abundant fossils of large, scallop-shaped shells – the remains of the extinct brachiopod *Gigantoproductus*. The riverbed at the top of the waterfall contains good examples.

In the bottom of the waterfall you can see light-grey sandstone beneath the limestone. This sandstone contains fossilized roots indicating that vegetation grew here in Carboniferous times. Such sandstone is called ganister. Shale lies on top of the limestone upstream of the waterfall.

The river easily erodes the shale above the limestone but the hard limestone and underlying sandstone are more resistant and stand proud forming a waterfall. The different weathering characteristics of limestone, sandstone and shale are the reason for the repeated bench-like profile of many of the hillsides of the North Pennines.

Follow Clargill Burn downstream back to the South Tyne. Cross the burn, pass through the gate in the riverside wall and continue to follow the Trail southwards.




Gigantoproductus *shells in Cockleshell Limestone*

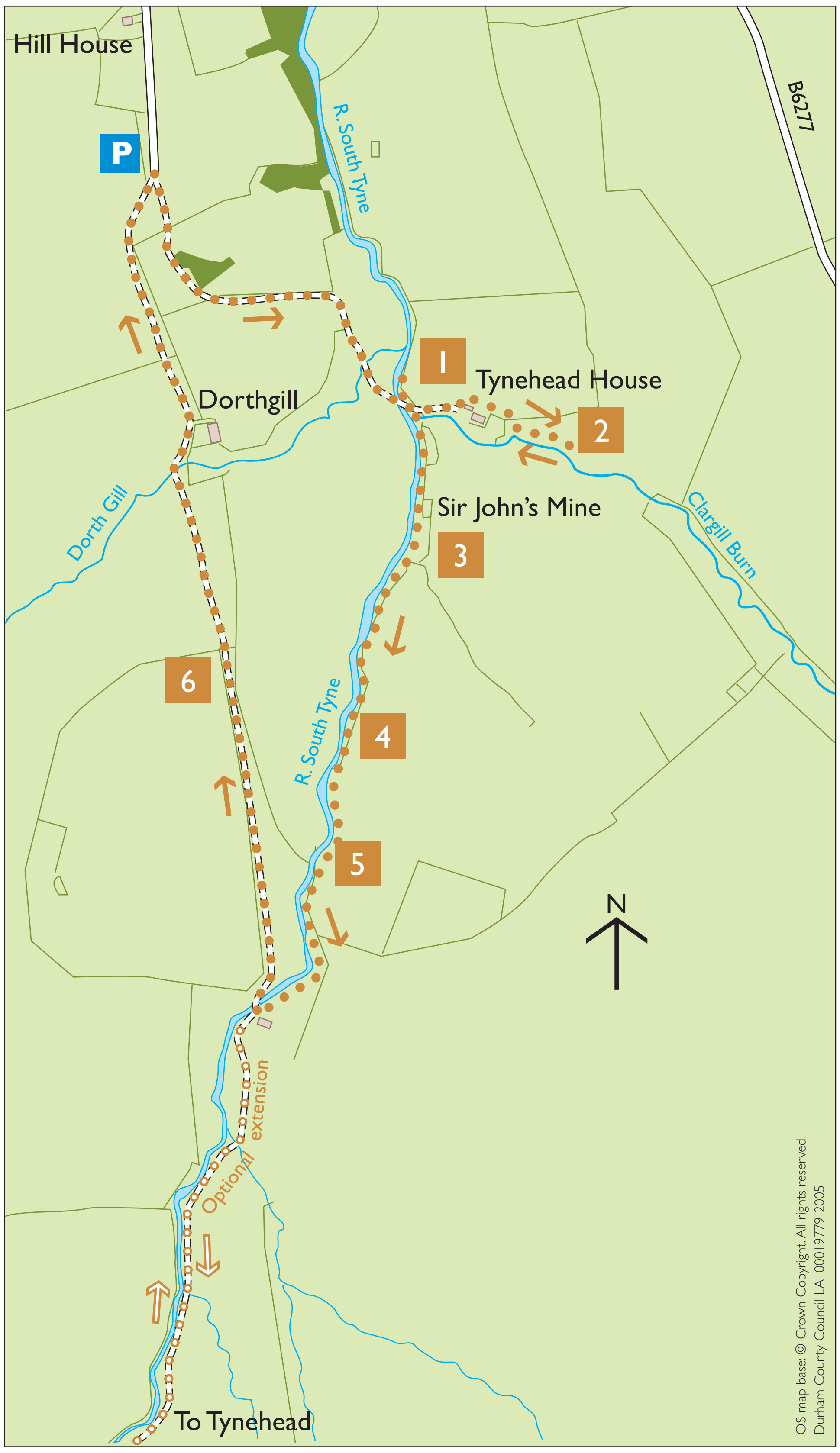
## 3 Sir John's Mine

Sir John's Mine worked lead ore from the Sir John's Vein during the latter half of the 19th century.

Sir John's Vein contains quartz with galena, sphalerite (zinc ore) and some chalcopyrite. The galena here contains one of the highest concentrations of silver in the North Pennines (approximately 40 ounces of silver per ton of lead). The mine entrance is visible here.

*Sir John's Mine*

The mine was re-opened during the Second World War in an attempt to work the Great Sulphur Vein for iron sulphide minerals, mainly pyrite, as a source of sulphur. Blocks of these sulphide-rich ores can be seen as rusty-looking blocks on the dumps. In the 19th century, an attempt was made to look for gold in the vein but none was found.




Follow the South Tyne Trail over two stiles and down towards the riverbank. Continue southwards, following the river, for approximately 70m.

## 4 Great Sulphur Vein

At this point, one of the largest veins of the North Pennines, the Great Sulphur Vein, crosses the trail. It is at least 14.5km long. Unlike the other veins on this trail, the Great Sulphur Vein is not just one mineral-filled crack but a number of them. Here in the South Tyne Valley it is two main veins; the northerly vein is visible here. The main mineral filling at this point is quartz and many small quartz-filled cracks are visible in the riverbed. Deeper in Sir John's Mine the vein carries significant amounts of the iron sulphide minerals pyrite, pyrrhotite and marcasite.

Follow the Trail southwards, keeping close to the fence, cross the stile and continue to follow the fence until you have a good view of the waterfall.

*The northerly strand of the Great Sulphur Vein. Many small quartz-filled cracks are visible in the riverbed*

## 5 Whin Sill waterfall

As the river flows down the gorge it passes over rusty brown-weathered rock with strong vertical cracks. This rock is known to geologists as dolerite. Unlike the limestone, sandstone and shale we have seen so far, dolerite is not formed from ancient sediments. It is formed from the cooling and crystallisation of molten rock. Such rocks are called igneous rocks.

The dolerite here forms part of the body of rock called the Whin Sill. This was injected into the layers of sedimentary rocks as a hot liquid at over 1100°C around 295 million years ago. Geologists use the term 'sill' to describe igneous bodies injected horizontally between rock layers.

As the Whin Sill cooled, it contracted and split along vertical joints to form columns. Columnar jointing such as this is a common feature of many igneous rocks. The Giant's Causeway in Northern Ireland and Fingal's Cave in Scotland are more well-known examples of columnar jointing.

Continue south along the South Tyne Trail, cross a stile onto the top of the gorge and head for the large barn in front of you. Join the metalled track, cross the river and follow the track down the valley towards Dorthgill, to the first cattle-grid.

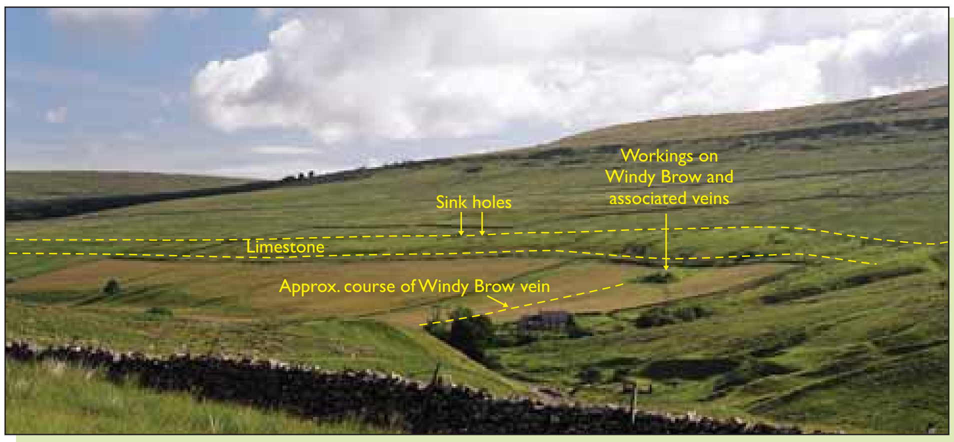
(If you wish, you can follow the track up to the source of the South Tyne, then return to this point.)

*The waterfall over the Whin Sill. The vertical cracks in the far wall of the gorge are columnar joints*

## 6 South Tyne Valley

The view north-east across the South Tyne Valley shows how the different rock types we have seen on this trail can have a dramatic effect on the landscape. The bulky form of the hills, their flat tops and the bench-like features of their sides that are so characteristic of the North Pennines, reflect the near-horizontal, alternating beds of limestone, sandstone and shale of which they are formed. The strong bench features are formed from resistant limestone and sandstone beds. The more easily eroded shale beds form the steep slopes between the benches. Spoil heaps, the remains of workings on the Windy Brow and associated veins, are visible above Tynehead House. Several sink holes, a common feature of limestone country, can also be seen. Limestone dissolves readily in rainwater. As a result, joints in the rock widen, cave systems develop and the overlying soil and rock debris fall into these openings generating distinctive hollows (sink holes) on the surface.

Follow the track back to the car park and the end of the trail.




*The view northeast across the South Tyne Valley*