

# Rocks of the North Pennines

A very brief guide



**North  
Pennines**  
National  
Landscape

The North Pennines are mainly made up of repeating layers of limestone, mudstone and sandstone that formed between 360 and 300 million years ago. At that time, the bit of the Earth's crust that is now the North Pennines was down near the equator in a warm, tropical environment at the edge of a shallow sea. As conditions changed, sometimes it was covered by the sea and sometimes the sea retreated and it was at the edge of the land. Then things would change and it was covered by the sea again, so the layers of rock repeat over and over and show us what the environment was like.

## Limestone



Usually a light grey colour with a slightly speckly surface. Often contains fossils of sea creatures like corals and shellfish. Fairly smooth surface. If you see a cliff face of it, it often has both horizontal and vertical cracks across it.

Limestone formed at the bottom of shallow tropical seas from the shells and skeletons of sea creatures getting crushed and buried in the mud at the bottom.

Limestone is a sedimentary rock.

## Mudstone (or shale)



Usually very dark grey and quite crumbly. Made of very fine grains of mud that are too small to see, built up in layers.

Tiny grains of mud sink to the bottom of the sea or rivers when the water is very still. They get buried and squashed and stuck together and form mudstone. In the North Pennines, layers of mudstone often come in between layers of sandstone and limestone.

Mudstone is a sedimentary rock.

## Sandstone



The sandstone in the North Pennines is usually a yellowish-brown colour. If you rub the surface, you can feel the grains of sand that make it up.

This sandstone was formed by huge rivers washing lots of sand down towards the sea. The sand would sink to the bottom, get buried and stuck together and form rock. You can often see the layers of sand on top of each other. Sometimes you can see swirls or ripples from the flow of the water.

Sandstone is a sedimentary rock.

# Other rocks in the North Pennines



**North  
Pennines**  
National  
Landscape

## Slate



Usually a light grey colour, and often brown where it's been open to the air. It often breaks up into flat layers, but harder and less crumbly than the mudstone.

You can't see this in many places because it's deep underneath the other rocks. Slate was originally like mudstone at the bottom of a sea, but heat and pressure have changed it over time. Slate in the North Pennines is over 400 million years old. The slate in the North Pennines isn't good for making roofs – lots of roof slates come from Wales or the Lake District.

Slate is a metamorphic rock.

## Red sandstones



This is a slightly pink colour and you can see and feel the sand grains in it. It is found in the Eden Valley in Cumbria and lots of buildings are made from it.

The red sandstone formed later than the rocks mentioned above, between 290 and 210 million years ago. It formed when the area was covered in deserts and sometimes flooded by rivers. There's a little bit of iron in the rock which makes it pink.

Sandstone is a sedimentary rock.

## Dolerite/Whinstone



Hard, dark grey or sometimes brown rock with a speckled surface. It is made up of interlocking crystals (not grains stuck together like the other rocks). If you see it in the landscape, it cracks vertically but not horizontally.

Dolerite (known locally as whinstone) was formed from magma (partially melted rock at 1000°C) that came up from within the Earth's crust and squeezed between the layers that were already there and cooled to form a big sheet called the Whin Sill. This happened 295 million years ago. It is underground across a large area of the north of England, and can be seen at Low Force, Holwick, High Force, High Cup Nick, Hadrian's Wall, and Bamburgh Castle to name a few.

Dolerite is an igneous rock.

# Key minerals



**North  
Pennines**  
National  
Landscape

Across the North Pennines there are lots of mineral veins. These formed when hot water with lots of minerals dissolved in it flowed through cracks in the rocks, and the minerals slowly crystallised inside the cracks about 290 million years ago. Common minerals in the North Pennines include quartz, fluorite, and ores of metals including lead, iron, zinc and barium.

## Galena



Galena is found within other rocks and is a mineral made up of dark, shiny grey crystals. There are often other crystals around it too, such as white-ish quartz. Rocks with galena in are very heavy.

Galena is a lead ore mineral (lead sulphide). It was mined across the North Pennines, and then smelted to extract the lead. Smelting involves heat and chemical reactions to separate out the lead metal. It was used for things like making water pipes, roofs, paints and bullets.

Lead metal is slightly poisonous (so we don't use it for our water pipes or in makeup any more!). Galena isn't, but you should still wash your hands after holding it.

## Fluorite



Fluorite is a calcium fluoride mineral, and forms cube-shaped crystals. They are often purple, but can also be green, or yellow, or white. It is often found around old mines.

Fluorite is the technical name of the mineral, but miners and most people call it fluorspar. 'Spar' minerals were waste products from metal mining, but fluorite started being mined for chemical industries, mainly in the twentieth century.