Holwick Scar & Low Force, Teesdale

Geo-activity trail

ORGANISATIONAL DETAILS

Aim

To explore the factors influencing the landscape of the area around Low Force and Holwick.

Target Group

Key Stages 2 and 3

Location

Low Force, Upper Teesdale

Practical Details

- Parking is free at the car park at Bowlees (GR: NY908281). Coaches can park on the main road opposite the footpath for Low Force (GR: NY 905281).
- Useful map – O.S. 1:25000 Explorer OL31, North Pennines Teesdale and Weardale.
- An additional leaflet, to be used in conjunction with these resources includes the Holwick Scar and Low Force Geological Trail produced by the North Pennines AONB Partnership.

Safety Issues:

- Sensible footwear, warm clothing and waterproofs are advised, as even in summer the weather in Upper Teesdale can be harsh.
- Refer to Hazard Identification Sheet.
- Duration 2 - 2.5 hours with a stop for lunch.

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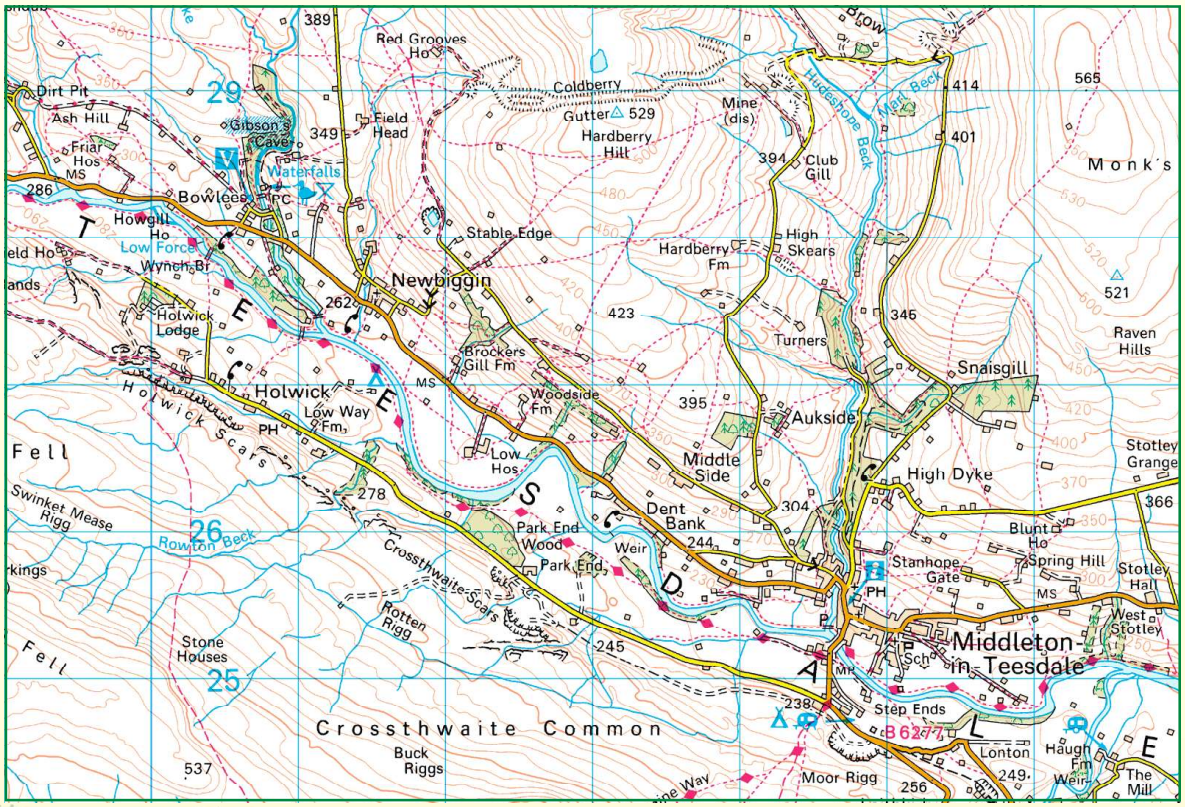
Teacher Resource Sheet



HAZARDS IDENTIFICATION SHEET

The following notes will help teachers conduct their own risk assessments. This is not a risk assessment and teachers should follow guidelines from the Department of Children, Schools and Families.

Hazard Identified	Risk and to whom	Control measures
Vehicles in the car park	Caution needed when getting off the coach as the parking area is small and other vehicles may be passing. All students and staff.	Supervise students getting off the coach or minibus and gather in a safe place.
Parking on the roadside	The road next to the coach parking area has fast traffic. All students and staff.	Supervise students getting off the coach or minibus and group them away from the road.
Fast traffic on the road	The road between Bowlees and Low Force has fast traffic passing. All students and staff.	Supervise students along the road.
Extreme weather conditions	Weather conditions can be very harsh even in the summer. All students and staff.	Ensure students have warm waterproof clothing and suitable footwear. Recommend a sun hat and water for trips in the summer.
Unfenced water	The River Tees is not fenced. All students and staff.	Warn students about the water.
Uneven paths	Paths are uneven and may be slippery in wet weather. Students may slip and fall. All students and staff.	Warn about conditions.
Slippery surfaces	The track and path can be slippery in wet conditions Care is needed. All students and staff.	Warn about conditions.
Wynch Bridge	The Wynch Bridge should only have one person crossing at a time. All students and staff.	Supervise students across the bridge.
Steep drop	The viewing area for Low Force on the south side of the river is by a very steep drop into the river and although there is fencing it is not very secure. All students and staff.	Warn about conditions. Supervise and control students in the viewing area.
Slippery rocks	The rocks at Scoberry Bridge can be very slippery especially when wet. All students and staff.	Warn about conditions and supervise when looking for fossils.

BACKGROUND INFORMATION

The table below provides background information for the Geo-activity Trail. The first activity provides a brief introduction to the area. The second activity leads you along the trail to Holwick and then back to Bowlees. The information provided links to stopping points along the route. This information should be used in conjunction with the Student Activity Sheet. After introducing the information at each point, the pupils decide which information sticker refers to the point and which picture sticker. They then need to decide if the information suggests that the geology, the work of ice sheets or people, have influenced the landscape at that point and attach the appropriate stickers under the correct category. The walk can be summarised using the information at the end.

It may be useful to use the 'Rock Box' to introduce limestone (Sample 7), sandstone (sample 11), shale (sample 13) and dolerite (sample 5) before the visit.

Route stopping point	Number on geological trail	Background information
Activity 1 Point 1 - The field	X	This is a circular walk from Bowlees to Holwick and back. It introduces the main factors that have influenced the landscape of Upper Teesdale. Look around you to get a view across Upper Teesdale. The hills are flat topped and the valley sides are in a series of steps. The rocks that form Upper Teesdale were formed in the Carboniferous Period of the earth's history, about 350 to 300 million years ago. The North Pennines was located close to the equator during the Carboniferous Period and as sea levels rose and fell, different rock types were formed. When sea levels were high, there was a shallow tropical sea and over time limestone was formed. As sea levels fell, rivers deposited mud and sand in the sea. The mud formed shale and the sand, sandstone. Limestone and sandstone are more resistant to erosion and form the steps we see in the landscape today. Shales are easily worn away and so form the gentler slopes. Limestone, sandstone and shale are sedimentary rocks. Sedimentary rocks are formed by the accumulation of materials such as mud or sand or the calcareous shells of sea animals. Activity 1 – from the edge of the field flat topped-hills can be seen and steps in the landscape. In the immediate foreground there is an area of coniferous trees. Beyond these is an area of higher land that is formed of dolerite or Whinstone. Explain this landscape and complete the activity on the sheet.
Activity 2 Point 2 - The north side of the Wynch Bridge	4	A bridge was originally built here so that lead miners from Holwick could cross the River Tees to work in mines on the north side of Teesdale.
Point 3 - The south side of the Wynch Bridge	4	The waterfall you are looking at is Low Force and it is flowing over a rock called dolerite or Whinstone. Dolerite is an igneous rock. Igneous rocks are formed from molten magma from inside the earth, which has cooled and solidified. The dolerite here was formed from molten magma from being injected into the surrounding rocks – the limestone and sandstone. You will see dolerite again later.
Point 4 - Whetstone	6	From the Wynch Bridge follow the river downstream and after a few metres you will see a rocky area with a large mass of rock. The rocks here are in layers or beds and were sandstones and shales. When the dolerite was injected a slab of sandstone and shale broke off and fell into the hot liquid rock and was heated and changed. The sandstone was hardened and the shale was changed into hornfels, or whetstone as the lead miners called it. As these rocks have been changed by heat they are called metamorphic rocks.
Point 5 - Mineral workings	7	Continue downstream towards Scoberry Bridge. On the right hand side you will see piles of rocks and tunnel entrances. Miners have tunnelled into the hillside here searching for lead ore. However the mineral veins here have very little lead in them. They do contain zinc but not in large enough quantities to work them.

Route stopping point	Number on geological trail	Background information
Point 6 - Limestone and fossils	8	Continue downstream to Scoberry Bridge. Cross the bridge and just on the right there is a bare area of rock next to the river. This rock is limestone and was formed from the skeletons of sea creatures that accumulated as a limey mud on the sea floor. If you look closely at the rocks here you will see white fossils preserved in the rocks. There are fossil shells of an extinct brachiopod called Gigantoproductus, which is similar to a modern day cockle. There are also fossil crinoids here. These long cylindrical fossils are the stems of the crinoids which are related to modern sea urchins and star fish.
Point 7 - Drystone walls	X	Go back across Scoberry Bridge and cross the stile in the wall in front of you. Follow the footpath to the farm buildings. At the farm buildings you will see drystone walls bordering the field to your right. The walls have been made of rounded boulders that the farmer has cleared from the field. These stones are called 'clearance stones'. The boulders are rounded as they have been moved by ice sheets during the last ice age. As the boulders were moved by the ice sheet they were knocked against each other, knocking off their corners and producing their smooth shape.
Point 8 - Striated boulders	X	Continue to follow the footpath through the field towards Holwick. The footpath is marked in places with large rounded boulders. These boulders, like the ones in the walls, were rounded as they were moved along by an ice sheet during the last ice age. If you look very closely at them you will see they are covered in scratches or grooves on their surface. These scratches or striations were caused as the boulders were ground together as they were dragged along in the ice sheet.
Point 9 - Holwick Scar	1	On reaching the road in Holwick, turn right along the road and follow it to the junction for Holwick Lodge. There is a Teesdale Time Trail panel at this point. At the information panel there is a good view of Holwick Scar. Holwick Scar is made of dolerite or Whinstone like the rocks at Low Force. The dolerite forms a horizontal band or sill of rock as it was formed by molten magma being injected into the surrounding rocks. The rocks look as though they are made of columns. This is because vertical cracks formed as the molten magma cooled and contracted
Point 10 - Drumlins	2	Take the track that goes to Holwick Lodge. After about 100m there is a gateway that provides a good view down the dale. Look over the gate and down the dale. The hills in front of you are smooth and look as if they have been moulded into long oval or egg-shaped mounds. An ice sheet covered this area during the last glaciation and material called 'till', (a mixture of sand, gravel, boulders and clay), was left covering the landscape. The ice sheet moulded this till into the elongated hills in front of you, called drumlins. The drumlins have a steeper slope at the upstream end than at the downstream end and their long axis is parallel to the direction of flow of the ice sheet. Drumlins therefore help us to know in what direction the ice sheet moved. Here the ice sheet was moving down the valley. Continue along the track to the cattle grid and then leave the track to take the footpath across the fields to the Wynch Bridge and then back to Bowlees.

There is more information about the geology of the area at the Bowlees Visitor Centre.

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Pupil Activity Sheet

Activity 1

Where am I?

This area is Upper Teesdale. The hills around you are flat topped and the valley sides are in a series of steps.

Draw a sketch and add the following labels:

Prominent ridge of dolerite or whinstone

Step in the landscape of more resistant sandstone or limestone

Slope of less resistant shale

Coniferous trees in the foreground

Activity 2

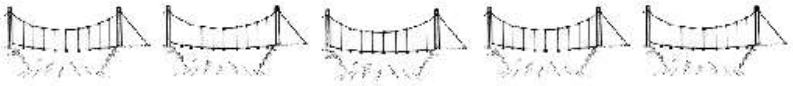
The landscape around you has been influenced by its geology (the rocks), the work of ice sheets that once covered the area and by people. At each stopping point you will be given information. You have to decide which pieces of information and picture stickers the information refers to. Then place your stickers in the correct box below to show if the information suggests that the landscape has been influenced by geology, the work of ice sheets or by people.

The landscape of Upper Teesdale has been influenced by:

Geology

The work of ice sheets

People

Written label	Picture label
The Wynch Bridge was built for lead miners to cross the River Tees so they could work in the mines on the north side.	
The waterfall at Low Force flows over igneous rocks of dolerite or Whinstone.	
The sandstone and shale rocks here have been changed as they were heated by the injection of the dolerite.	
The tunnels in the hillside were made by miners looking for lead ore.	
Fossils of sea animals can be seen in the limestone. There are shells of brachiopods and stems of crinoids.	
The drystone walls of the farm are made of rounded boulders left by an ice sheet.	
The boulders along the footpath have been scratched as they were moved by the ice sheet.	
Holwick Scar is made of dolerite. The dolerite or Whinstone was formed by molten magma being injected into the rocks.	
These smooth oval hills are drumlins and are formed by an ice sheet moulding glacial debris.	

This sheet needs to be printed onto sticky labels (Avery Labels No. L7651)