

Tynehead, Cumbria



Geo-activity trail

ORGANISATIONAL DETAILS

Aim

To look at how the rocks of the North Pennines have influenced the landscape

Target Group

Key Stages 2 & 3

Location

River South Tyne, south of Garrigill.

Practical Details

- There is limited parking just south of Hill House, just before the cattle grid (GR: NY757384), which is suitable for a minibus but not a coach.
- Useful map – O.S. 1:25000 Explorer OL31, North Pennines Teesdale and Weardale.
- An additional useful leaflet is the Tynehead Geological Trail produced by the North Pennines AONB Partnership.

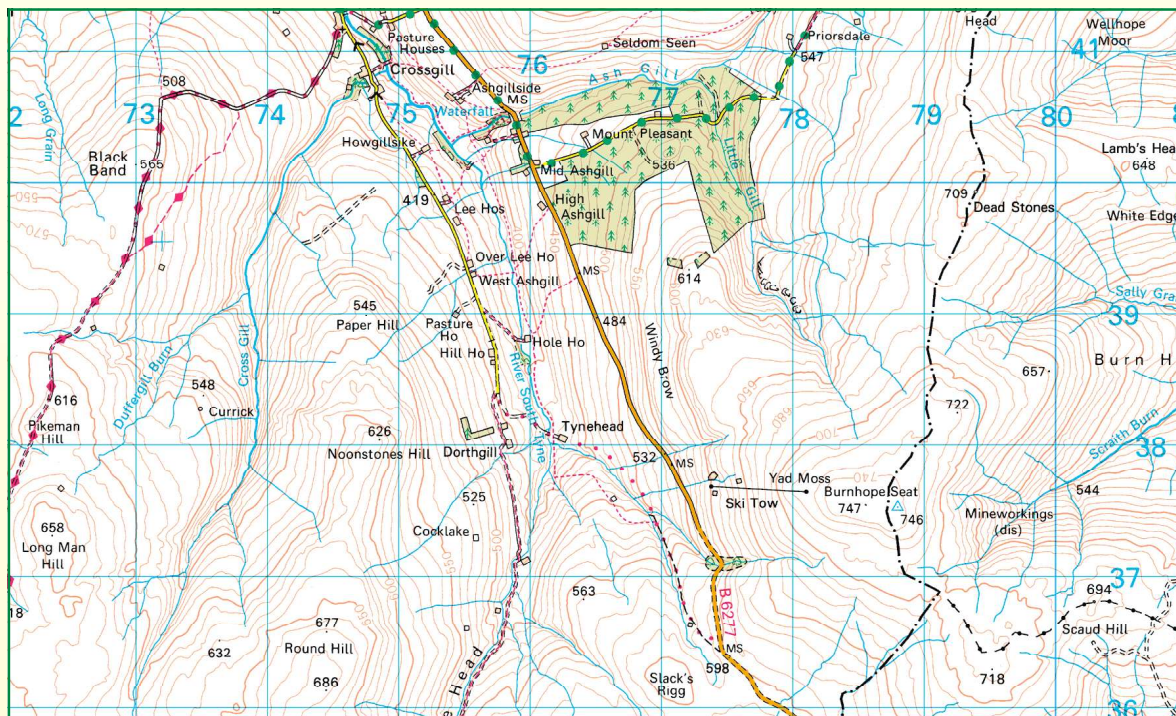
- Follow the route map stopping at the points indicated.
- You will need the rock and mineral dials.

Safety Issues:

- Sensible footwear, warm clothing and waterproofs are advised, as even in summer the weather can be harsh.
- As much of the trail is along the River South Tyne it is best undertaken when the river is in low flow.
- Refer to Hazard Identification Sheet.
- Duration 2 - 2 hours and 30 minutes 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
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 South Tyne 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.
Narrow paths and steep slopes	Some parts of the footpath are narrow and there are steep slopes below. All students and staff.	Warn about the conditions and ensure single file on narrow parts of the path.
Changing river levels	The river can rise very quickly in the River South Tyne and much of the walk is along the river. All students and staff.	Be aware of changing weather conditions and keep away from the edge of the river in high flow conditions.

BACKGROUND INFORMATION

The table below provides background information for the Geo-activity Trail. This information should be used in conjunction with the Student Activity Sheet. After introducing the information at each point the pupils complete the relevant activity. The walk can be summarised using the information at the end.

As this trail looks at the main rocks of the North Pennines and their influence on the landscape it would be useful to introduce the main rock types in the classroom before hand using the 'Rock Box'. The various characteristics of limestone, sandstone, shale and dolerite should be looked at. In particular, look at the relative hardness of each of the rock types as this has a major influence on the landscape you will be looking at. It would also be worth showing how limestone is dissolved by weak acid by adding dilute hydrochloric acid to the limestone (sample 7) in the 'Rock Box' and seeing how it fizzes.

Route stopping point	Number on geological trail	Background information
Point 1 - View across the South Tyne Valley	X	<p>Follow the path marked to Yad Moss. Once on this footpath, stop at a point where you have a good view across to the opposite side of the South Tyne valley. The landscape you see reflects the rocks below it. Describe the view from the top to the bottom – the bulky flat-topped hills reflect the fact that the North Pennines are made up of horizontal layers or beds of limestone, sandstone and shale. As you look down the hillside you can see benches, or steps, that stand out in the landscape – these are formed by the harder or more resistant limestone and sandstone layers. The softer, more easily eroded shale layers form the slopes between the benches.</p> <p>The limestone, sandstone and shale are all sedimentary rocks formed by material deposited in a warm, shallow tropical sea.</p> <p>A limestone bench can be seen just above the field boundary above Tynehead House. This limestone bed extends across the view you are looking at and relates to the waterfall on Clargill Burn, which is stopping point 2.</p> <p>Looking across at the limestone bench you can see small hollows in the hillside. These are sink holes and have formed where acid rainwater has dissolved the limestone along cracks or joints. Where the joints are widened by the rainwater, hollows or even caves form below and the overlying soil falls in, leaving distinctive hollows on the surface.</p>
Point 2 - Waterfall in Clargill Burn	2	<p>Follow the track up to Tynehead House and then the route to the south of the house that carries on up along Clargill Burn. After about 100m you will see a waterfall on the Clargill Burn. The water is flowing over the limestone layer that you were looking at previously. Above this limestone is shale and below is a mixture of shale and sandstone. Both the shale and sandstone are softer than the limestone. The river has eroded the shale and sandstone below the limestone more easily and created a step in the river. The step in the river's profile creates the waterfall. As the shale and sandstone beneath the limestone are worn away, the limestone is left unsupported and will collapse into the river. Gradually the waterfall will move upstream. The Student Resource Sheet at the end of this section can be used to make a 'flicker' book to show how this waterfall was formed.</p>
Point 3 - Sir John's Mine	3	<p>Follow the path back to the South Tyne and cross the Clargill Burn by the footbridge. Go through the gate and follow the South Tyne Trail along the field boundary. The spoil heaps, ruined buildings and mine entrance are all visible along the path. Sir John's Mine was a lead mine, although some other minerals were also worked from it. The galena or lead ore mined here contain a high concentration of silver.</p> <p>Look for minerals in the spoil heaps. Galena is a metallic silver colour, zinc ore is black and iron sulphide is the rusty-looking blocks.</p>

Route stopping point	Number on geological trail	Background information
Point 4 - Whin Sill waterfall	5	<p>Follow the South Tyne Trail over two stiles and down towards the river. Follow the trail south staying close to the fence. Cross the stile and follow the fence until you have a good view of the waterfall.</p> <p>This is a much larger waterfall on the River South Tyne. This waterfall was formed in exactly the same way as the one on Clargill Burn, except that different rock types are involved. The water is flowing over a rock called dolerite and if you look carefully you will see that this rock is formed in columns. Dolerite is not a sedimentary rock but has been formed from molten rock from inside the Earth being injected into the layers of limestone, sandstone and shale that make up the North Pennines. It is an igneous rock. Dolerite or Whinstone, as it is known locally, is a very hard rock and so forms the step of the waterfall. The softer rocks below it are sandstone and shale. Again, use the Student Resource Sheet at the end of this section to make a 'flicker' book to show how this waterfall was formed.</p>
Point 5 - South Tyne Valley	6	<p>Cross the stile at the top of the gorge and head for the barn in the distance. Join the metalled track and follow it to the second field boundary on the left.</p> <p>From this second field boundary there is a good view across the South Tyne Valley. Use this view to reinforce what has been covered on the walk – horizontal layers of limestone, sandstone and shale, the benches of harder rock, the sink holes in the limestone and the two waterfalls formed from hard and soft rocks.</p> <p>Continue along the track to the parking area.</p>

The return journey to the car park can be made by crossing the River Tees on the bridge below the dam and then walking up the side of the dam and across the dam to rejoin the nature trail. Once at the car park the volcano activity on the Student Information Sheet could be done or this could be used later in school

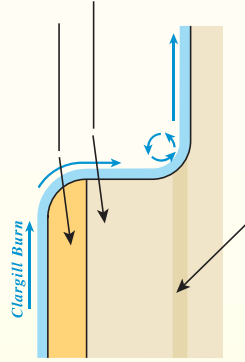
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Pupil Activity Sheet

2 Waterfall on Clargill Burn

On the diagram below label the following:

- Harder rock - limestone
- Softer rocks - shale and sandstone
- Limestone left unsupported



3 Sir John's Mine

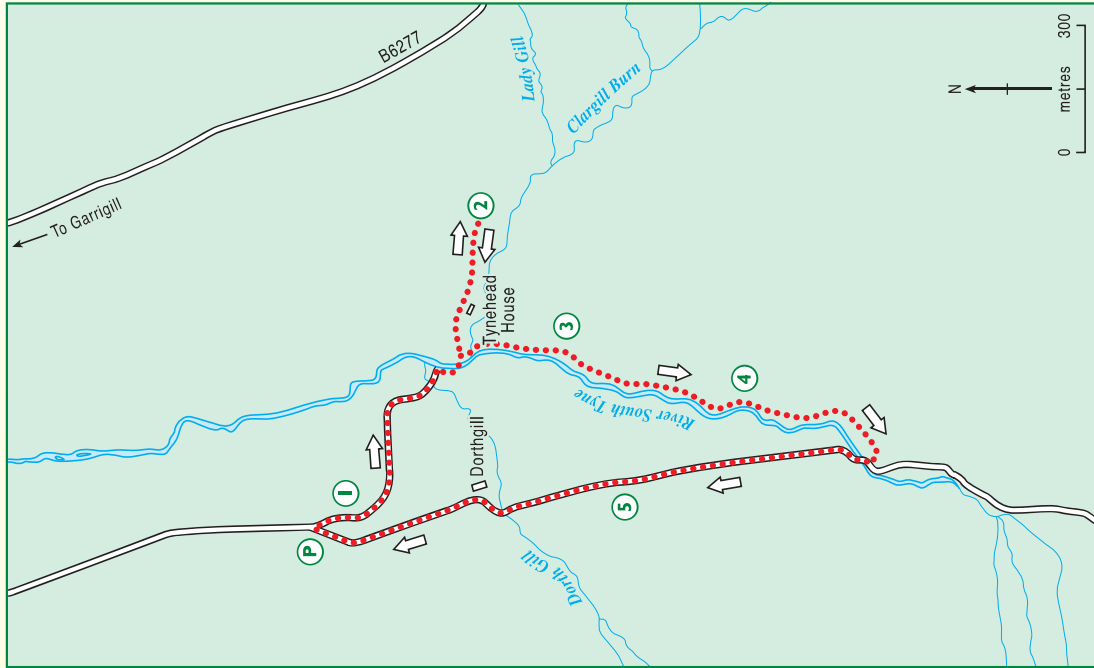
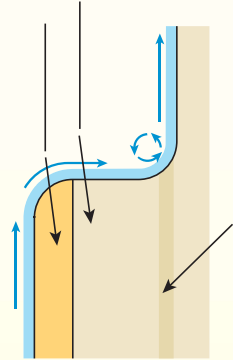
Tick which minerals you find in the spoil heaps:

Mineral	
Lead ore (Galena)	<input checked="" type="checkbox"/>
Zinc ore (Sphalerite)	<input type="checkbox"/>
Iron sulphide (Pyrite)	<input type="checkbox"/>

4 Waterfall on the River South Tyne

On the diagram below label the following:

- Harder rock - dolerite
- Softer rocks - shale and sandstone
- Dolerite left unsupported



1 View of the South Tyne Valley

Draw a sketch of the view across the South Tyne Valley.

Add the following labels:

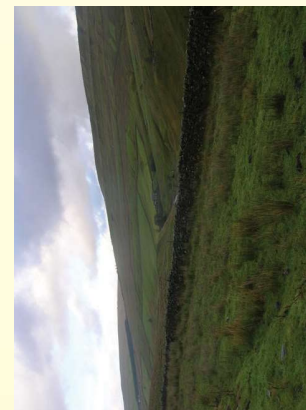
- Flat-topped hill
- Hard rock benches
- Sink holes in limestone
- Clargill Burn
- Tynehead house
- Softer shale slopes
- Position of waterfall at location 2



5 View of the South Tyne Valley

On the photograph below, label the following:

- Flat-topped hill
- Hard rock benches
- Sink holes in limestone
- Clargill Burn
- Waterfall
- Softer shale slopes





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Pupil Resource Sheet

WATERFALL FLICKER BOOK

Produce your own explanation of how the waterfall was formed on either the Clargill Burn or on the River South Tyne.

Instructions:

1. In the blank box below put the title '**How _____ waterfall and gorge were formed**'. Under the title describe how the waterfall and gorge were formed. Here are some words to help you:

Recedes **Hard resistant rock** **Less resistant rock**
Water wears away **Boulders** **Plunge pool**

2. Colour the diagrams below with the hard rock a dark colour and the limestone and sandstone a light colour.
3. Cut your title box and diagrams out and make them into a booklet by stapling the edges.
4. If you now flick through your booklet you will see the waterfall moving upstream to leave a gorge.

