

# 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.

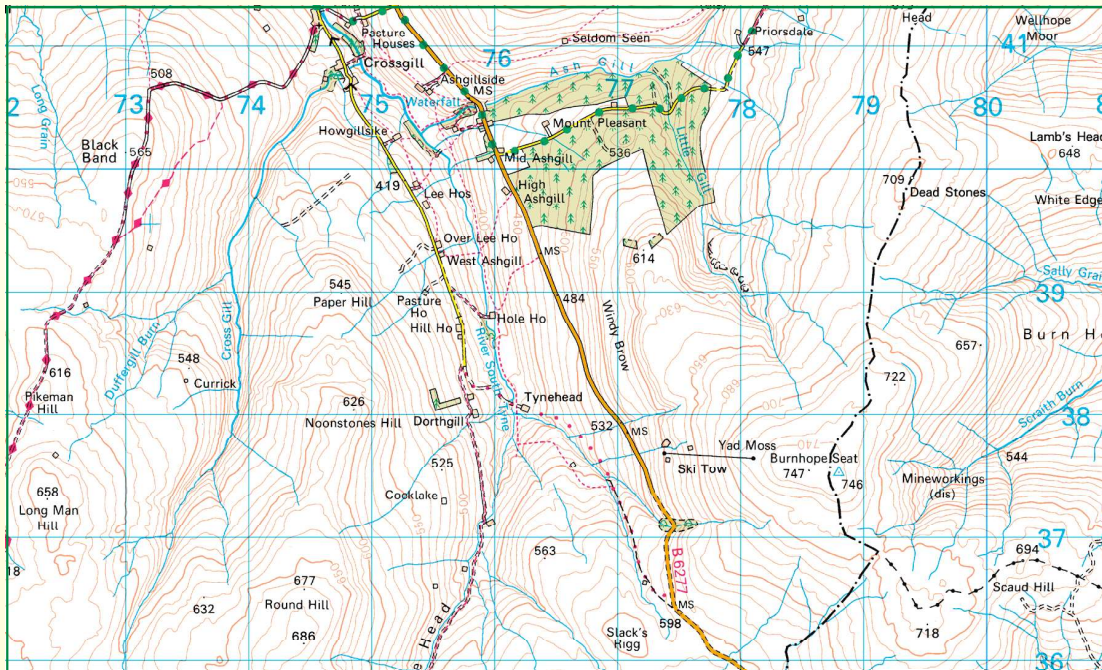
- Follow the route map stopping at the points indicated.
- You will need the rock and mineral dials.

### 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 - 5 hours with a stop for lunch.

# Tynehead, Geo-activity trail

## 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 or minibus in the car park as the parking area is narrow and vehicles may be passing. All students and staff.	Supervise students getting off the coach or minibus and gather in a safe place.
Vehicles on the road	Students need to get off the coach at the lay-by on the main road. Cars travel fast along this stretch of road. All students and staff.	Supervise students along the road.
Uneven paths	Paths are uneven and may be slippery in wet weather. Students may slip and fall. All students and staff.	Warn about conditions.
Working in rivers	Rocks in the river may be slippery and there is the risk of falling into the river. All students and staff.	Warn about conditions and the possibility of hypothermia if getting wet.
Walk to High Force	River bank unfenced. Steep unfenced drop on last section of path before reaching High Force Hotel. All students and staff.	Warn about river. One person on the Wynch Bridge at a time. Keep together as a group.
High Force car park	Traffic in car park. All students and staff.	Supervise students getting off the bus.

## 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
<b>Activity 1</b> Point 1 - The field	X	<p>This is a circular walk from Bowlees to Holwick and back. It introduces the main factors that have influenced the landscape of Upper Teesdale.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>
<b>Activity 2</b> Point 2 - The north side of the Wynch Bridge	4	<p>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.</p>
Point 3 - The south side of the Wynch Bridge	4	<p>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.</p>
Point 4 - Whetstone	6	<p>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.</p> <p>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.</p>
Point 5 - Mineral workings	7	<p>Continue downstream towards Scoberry Bridge.</p> <p>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.</p>



Route stopping point	Number on geological trail	Background information
Point 6 - Limestone and fossils	8	<p>Continue downstream to Scoberry Bridge. Cross the bridge and just on the right there is a bare area of rock next to the river.</p> <p>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.</p>
Point 7 - Drystone walls	X	<p>Go back across Scoberry Bridge and cross the stile in the wall in front of you. Follow the footpath to the farm buildings.</p> <p>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.</p>
Point 8 - Striated boulders	X	<p>Continue to follow the footpath through the field towards Holwick.</p> <p>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.</p>
Point 9 - Holwick Scar	1	<p>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.</p>
Point 10 - Drumlins	2	<p>Take the track that goes to Holwick Lodge. After about 100m there is a gateway that provides a good view down the dale.</p> <p>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.</p> <p>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.</p> <p>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.</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



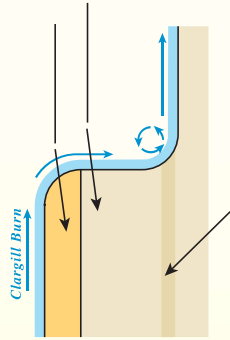
# Tynehead, Geo-activity trail

## Student Activity Sheet 1

### 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

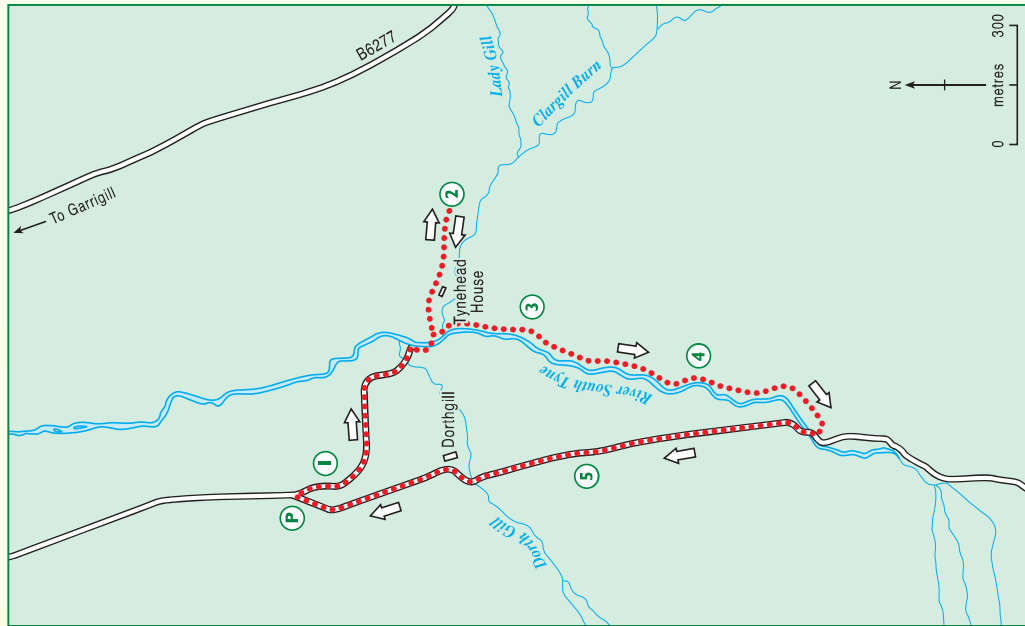
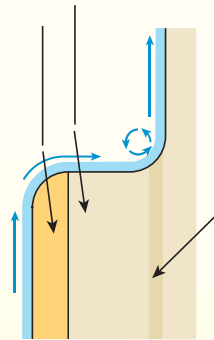
Tick which minerals you find in the spoil heaps:

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

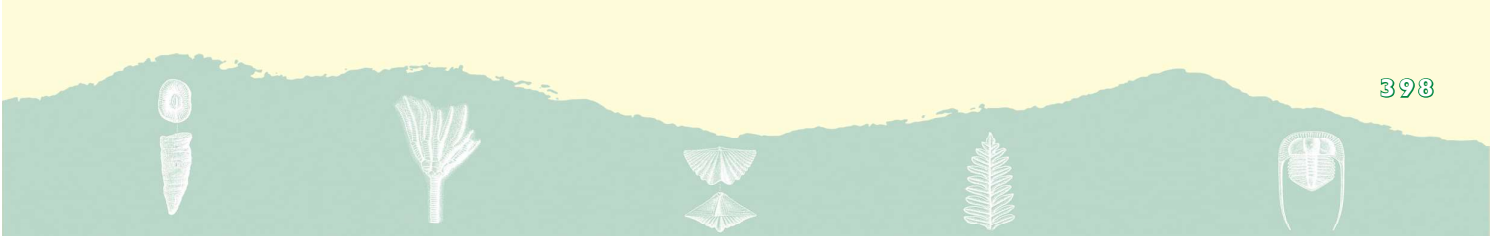
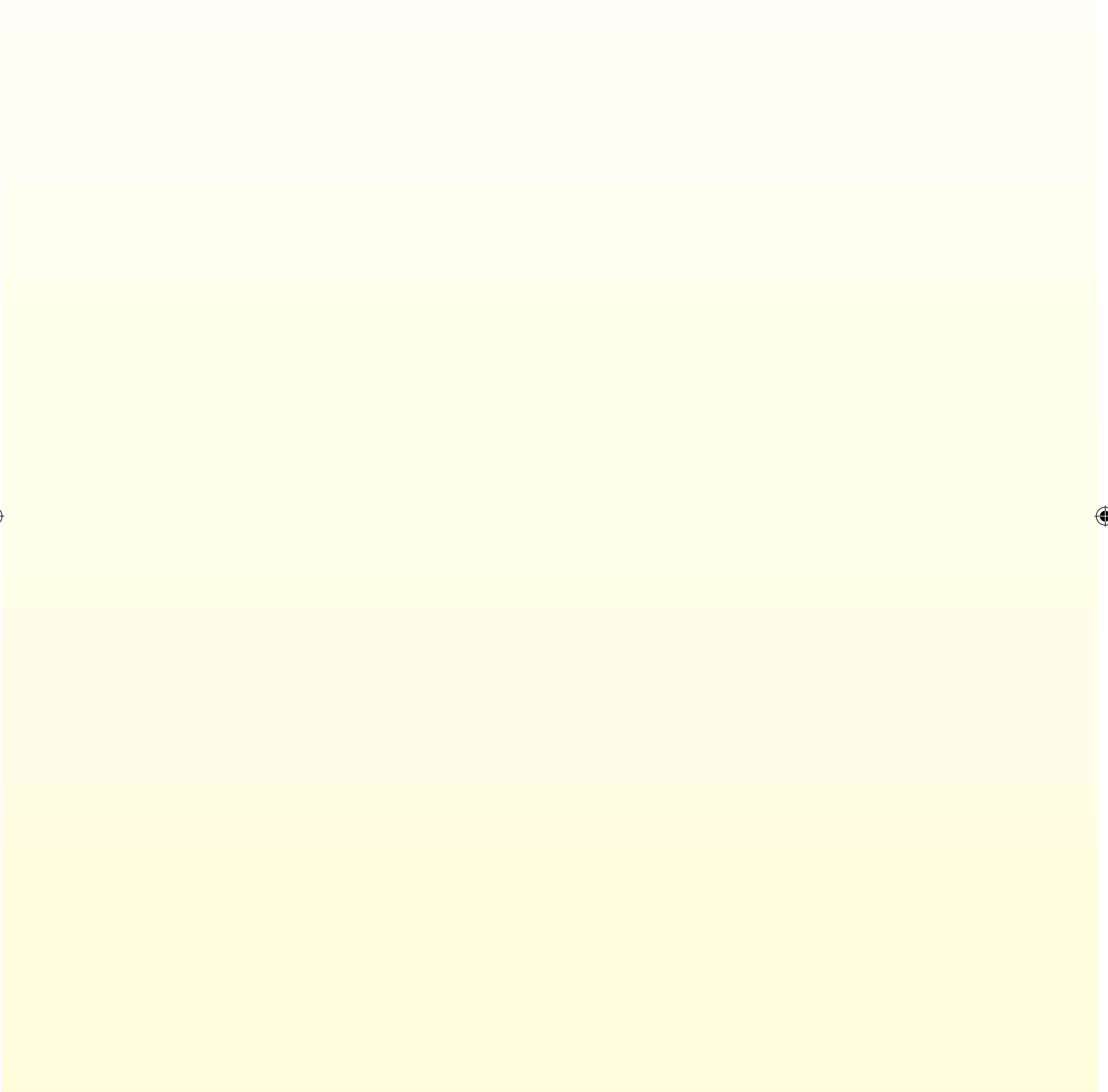
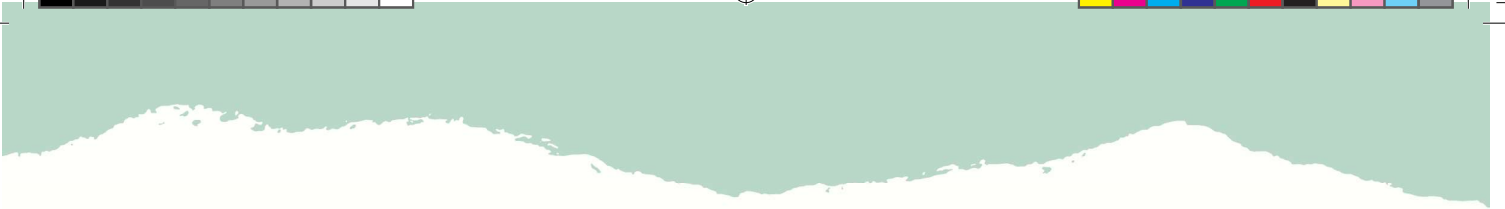


### 5 View of the South Tyne Valley

On the photograph below, label the following:

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





# Tynehead, Geo-activity trail

## Student Activity Sheet 2

### WATERFALL FLICKER BOOK

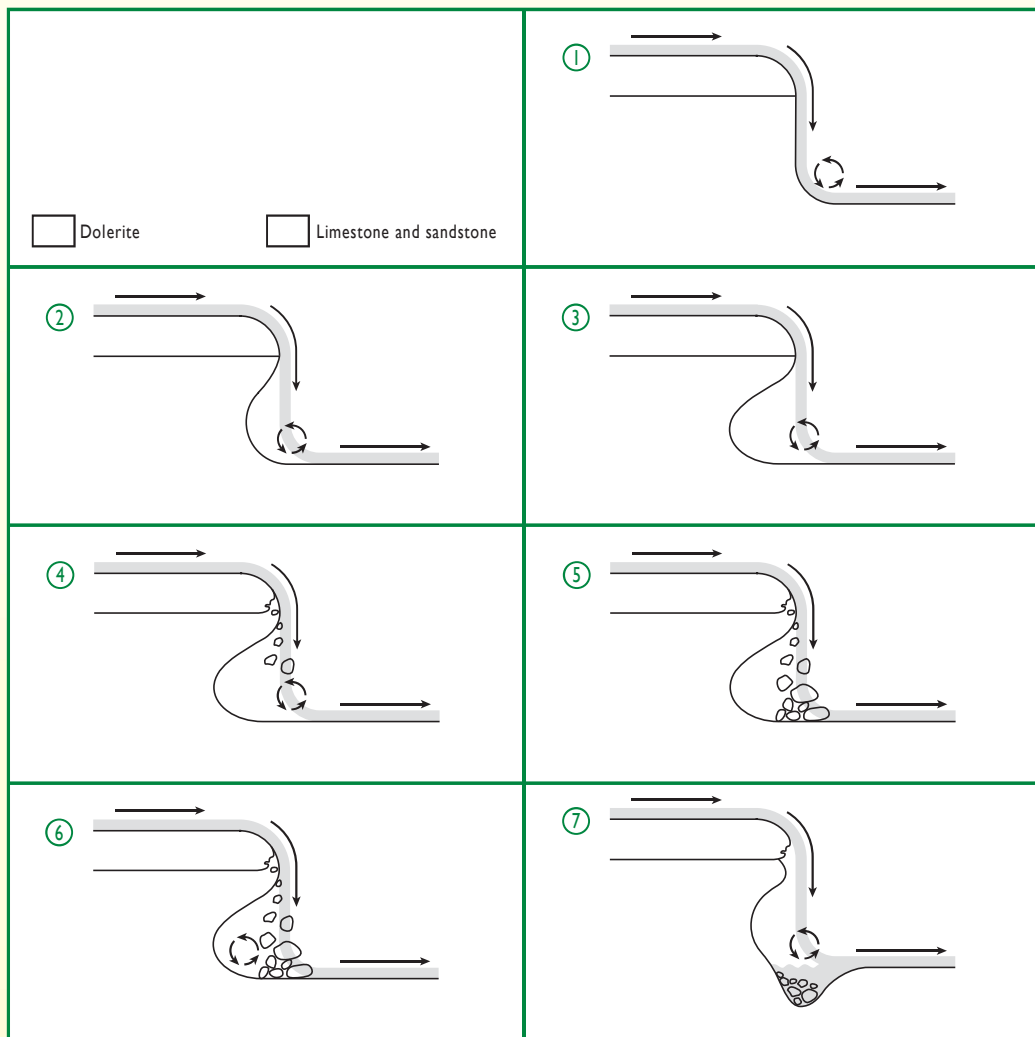
Produce your own explanation of how the waterfall was formed on either the Cargill Burn or on the River South Tyne.

**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.







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# Pennine Escarpment

*Signposting of places of interest and information on  
the Pennine Escarpment*

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**1. Nenthead Mines Heritage Centre** – Run by the North Pennines Heritage Trust the centre can provide an exciting day out with the opportunity to explore an authentic lead mine. Discover what life was like as a Victorian miner or take advantage of a range of workshops run by our dedicated education team. There is a shop and a café providing light refreshments and an education base for packed lunches/workshops.

For further details about the centre and our education programme contact the education office on 01434 382037 or details are available at [www.npht.com/education](http://www.npht.com/education).

**2. Tourist Information Centre** – Tourist information is available at Alston Town Hall (01434 382244).



